

METAL FINISHING

REPARATION, ELECTROPLATING, COATING

ESTABLISHED FOR THIRTY-SEVEN YEARS AS METAL INDUSTRY



LEA FINISHING METHODS LEA FINISHING COMPOSITIONS

INDUSTRY'S BEACON

during Its Great Prewar Expansion Era

INDUSTRY'S GUIDE

to Surer and Faster Production on Tough War Schedules

INDUSTRY'S WAY

to Better and More Economical Postwar Decorative and Commercial Polishing, Buffing and Burring

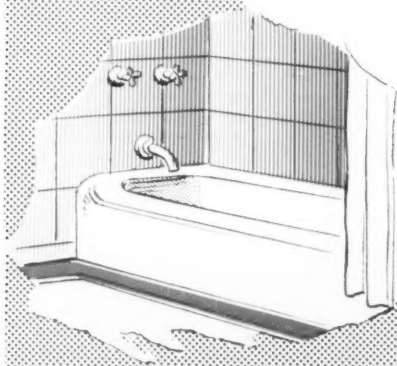
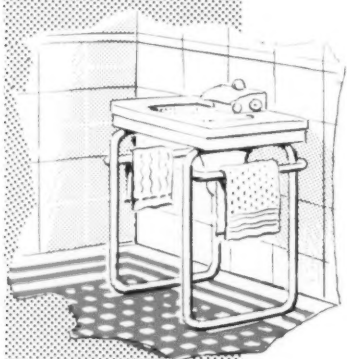
It was a common sight in countless war-schedule plants—this foil covered bar with its yellow and red decal reminding the user that it was LEA COMPOUND. Yes, countless plants used this greaseless composition and its companion LEAROK, the composition with "no-free-grease."

Useful as these compositions were to industry, the Lea Technical Service in connection with finishing problems was even more valuable. It helped hundreds of companies devise faster, better and more economical finishes. This same service—now even more experienced, and the same compounds—with new grades are ready to help you with your post-war program.

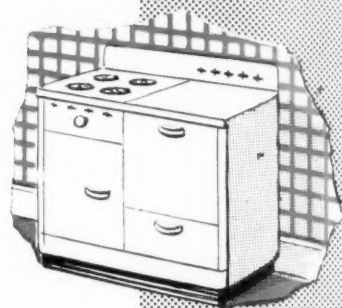
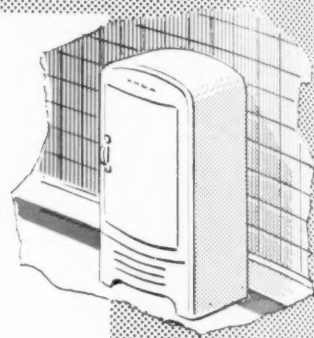
THE LEA MANUFACTURING CO.
WATERBURY 86, CONN.

Burring, Buffing and Polishing . . . Manufacturers and Specialists in the Development of Production Methods and Compositions

CLEANING PRIOR TO PORCELAIN ENAMELING



Production tests have shown that porcelain enamel rejects are reduced by using Clepo 26-E in the cleaning operation. The reason for these good results is that Clepo 26-E is very free rinsing and therefore does not interfere with the adherence of the nickel dip. Also Clepo 26-E has extremely high oil penetrating qualities so that even the most stubborn oils are completely removed in a one-minute cleaning time. Clepo 26-E is buffered so that the oil removed is kept in suspension and does not float on top of the solution. If you would like to make arrangements for a production test in your plant right now, contact us as quickly as possible. The improved results obtained by using Clepo 26-E will amaze you.



Memo to Plant Engineer:

*To Reduce Porcelain
Enamel Rejects
Specify Clepo 26-E
for Cleaning prior
to Nickel Dipping*

FREDERICK

GUMM

Chemical Company Inc.

538 FOREST STREET, KEARNY, N. J.

METAL FINISHING

PREPARATION, ELECTROPLATING, COATING

Founded as Metal Industry, January, 1903 by Palmer H. Langdon, 1868-1935

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CLEANING AND CORROSION TIPS

Issue
No. 3

JULY

1946

IT'S THE CLEANING PROCESS THAT COUNTS

You and I know a fellow may be well dressed—but he can't walk very far if his shoes don't fit.

Similarly, any good chemical cleaning material is limited by the manner in which it is used. I'm referring not only to the equipment itself, but, more specifically to the sequence of operations—the cycle, if you will, and the conditions in each step in the cycle.

The cleaning cycle is a *team* of operations working together to remove the obstacle, the soil, and to prepare the way for subsequent finishing operations.

Just as a powerful fullback may be thrown for a loss if an end misses his block—so a good cleaner will fail if its "blockers"—equipment, temperature, time, current, rinsing, etc., are inadequate. Thus, our sales servicemen are trained to think of the "Cleaning Process," rather than just the cleaner itself.

Wm. P. Drake
Manager of Sales
Pennsylvania Salt Manufacturing Co.

CASE NO. 704

Heat Treating, Quenching, and Cleaning Cycle Speed Increased 100%

A machine tool manufacturer had a rack conveyorized cycle of heat treating, quenching and cleaning for steel tool parts. The metallurgist was on the spot because the cleaning of oily salts from the parts was slowing up the whole process. He called on a Pennsalt man for help. After a complete investigation of the cycle, he recommended Pennsalt Cleaner No. 37. This quick acting, heavy duty cleaner cut the cleaning time in half . . . without increasing the number or size of the tanks.

This proved to be even faster than necessary for the heat treating and quenching phases of the cycle. Then a new method of racking the work was designed by the Pennsalt man and the metallurgist for maximum production efficiency of the conveyor system. Now heat treating, quenching and cleaning speed is up 100%—production costs are much lower.

CASE NO. 751

Large Motor Manufacturer Eliminates Bonderite Streaking

Cleaning equipment down-time cut from 5 hours to 25 minutes weekly

An all-automatic conveyorized system was being used to clean, bonderize, and paint sheet steel parts. In spite of the efficient equipment, the cleaning foreman was plagued by streaks on the bonderizing and subsequent poor paint finish. In addition, down-time for changing the screens in the cleaning tank was stopping production 5 hours weekly.

The Pennsalt man called in to solve this tough problem saw that major changes were needed in the cleaning operation. He recommended a solvent-alkali cleaning method consisting of Pennsalt #30 (Alkaline Cleaner) and Pennsalt EC #10 (Solvent Emulsion Cleaner), both of which could be used in the regular equipment. Production shut downs, due to clogged screens were practically eliminated. Bonderite streaking disappeared. The paint foreman reported, "We have never had a better paint job."

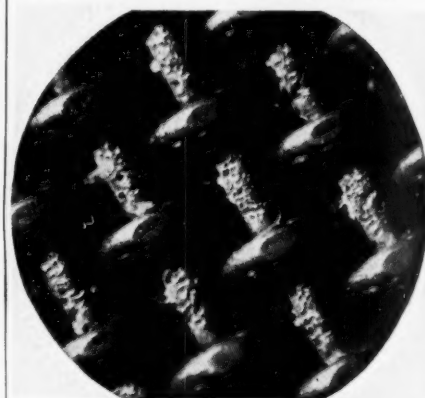
TANK FOR PICKLING STEEL



Tank lined with double course acid-brick, laid entirely with Penchlor Acid-Proof Cement, which gives thorough protection against severe corrosive action of 10% sulphuric acid at 180° F. and withstands the physical abuse resulting from submerging and withdrawing steel plates.

THE LAB NOTEBOOK

Frequently it is necessary to develop cleaning methods for customers wherein the metal must be chemically clean and not attacked by the cleaner. To determine if there is an attack and the amount of it, photomicrography is used. The photomicrograph of a fine copper wire screen shown below has been especially prepared (purposely etched) to indicate how even infinitesimal etching of metals by the cleaner can be detected. This is but one of the many methods employed by the Pennsalt Whitmarsh Research Laboratories in a continuing effort to develop better cleaning processes.



CASE NO. 769

Cleaning Foreman Helps Plant Engineer Lick Water Scale Problem

In a large industrial plant the heat exchanger of an air conditioning unit frequently lost its efficiency and required dismantling to remove hard water scale. Two to three days were required to remove the scale by manual chipping. At best, only a fair job could be done.

Because of the cleaning foreman's experience with cleaning metal chemically, the plant engineer asked for his advice on the problem. "Let's put it up to the Pennsalt man," suggested the cleaning foreman. Subsequently, Pennsalt PM-90 was put to the test. In less than 3 hours the metal of the heat exchanger was bright and clean, absolutely free of its heavy deposit of scale.

Pennsalt PM-90 is an acid-type chemical cleaner. It can be used warm or cold, concentrated or diluted to remove rust, corrosion and scale deposits. Can be used safely on iron, steel, copper, brass, bronze, nickel, and their principal alloys.

The Pennsalt Man is trained to help you produce better cleaned products at a faster rate and at lower cost. If you would like to see him, write to Dept. MF-6. If your problem is urgent—wire, and he will call immediately.



PENNSALT

96 YEARS OF SERVICE TO INDUSTRY

PENNSYLVANIA SALT MANUFACTURING COMPANY
Chemicals

Special Chemicals Division
1000 WIDENER BUILDING, PHILADELPHIA 7, PA.
NEW YORK • CHICAGO • ST. LOUIS • PITTSBURGH
CINCINNATI • MINNEAPOLIS • WYANDOTTE • TACOMA

This Time It's Silver

It is estimated that silverware manufacturers and platers will be short of 1946 requirements by about 50,000,000 ounces of silver if legislation is not passed releasing the hoard of metal buried in the vaults at West Point. Since the expiration of the Green Act on December 31st, the Treasury Department cannot, under existing law, sell any part of the 225,000,000 ounces of silver it owns over and above that required for monetary purposes at less than \$1.29 an ounce.

The trade is perfectly willing to purchase this silver at the O.P.A. ceiling price of 71 cents, which may be compared with the pre-war level of 35 cents, but Senators from six western, silver producing states are fighting to have the \$1.29 price established for all silver, whether from foreign or domestic sources. Their delaying tactics have prolonged hearings while the situation daily grows more acute, even though legislation authorizing release of Treasury silver has twice passed in the House, approved by both the majority and minority leaders.

American miners will probably produce less than one-quarter of the silver needed by American industries, while foreign suppliers, especially Mexico, Canada, Peru and Bolivia are reported to be holding back their silver supplies in the expectation that the silver bloc in Congress will have its way and they will then receive the higher price for their metal stocks.

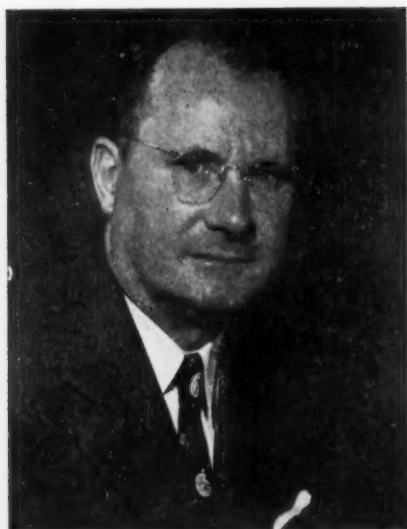
Unless supplies of silver are made available shortly, production of silverware and silver plated articles will have to be curtailed sharply, and many plants will be forced to close, throwing thousands out of work, all because of the greed of a few mine owners. Whether it's done by the public or by the government, we still call it hoarding and, in this particular case, our government is setting a far-from-shining example for the rest of us.



Walter L. Pinner
Supreme President



Frank Savage
Supreme First Vice-President



Ray O'Connor
Supreme Second Vice-President



Kenneth M. Huston
Supreme Third Vice-President



Dr. A. Kenneth Graham
Executive Secretary and Business Manager

American Electroplaters'

33rd Annual Convention

June 17-18-

Men's Program

Sunday—June 16th

Afternoon—3 P. M.

Registration on the Seventeenth Floor of the William Penn Hotel.

Monday—June 17th

Morning—10:15 A. M.

Opening Session, Urban Room.

Invocation:—Reverend Frank C. Mesle.

Formal Opening of 1946 Convention, S. S. Johnston, Convention General Chairman.

Welcome to Pittsburgh: Hon. David L. Lawrence, Mayor of Pittsburgh.

The Pittsburgh Branch Appreciates: Frank R. Keller, President of the Pittsburgh Branch.

Report of the Supreme President: Walter L. Pinner, A.E.S. Supreme President.

All Educational Sessions are scheduled to be held in the Urban Room, Seventeenth Floor, William Penn Hotel.

Afternoon—2 P. M.

First Educational Session, W. M. Phillips, presiding.

Evening—9 P. M.

Open House sponsored by the International Fellowship Club. Ballroom of the William Penn Hotel.

ELECTROPLATING'S wartime advances and their potential applications to peacetime production will be surveyed at the 1946 Convention to be held at the William Penn Hotel in Pittsburgh.

The schedule features five Educational Sessions which include the presentation of thirty-two technical papers, each covering some phase of the plating industry.

S. S. Johnston is general chairman of the Convention. His committee is composed of R. A. Dimon, educational; J. L. Wray, hotel reservations; Leo J. Schmitt, registration; W. J. Hennessy, publicity; H. F. Saylor, entertainment and banquet; R. O. Hummel, transportation; Wilfred S. McKeon, exhibits; F. R. Keller, secretary-treasurer and assistant chairman.

The International Fellowship Party is planned for Monday evening. The Job Platers Dinner-Meeting will be held Tuesday evening at 6:30 P. M. An Informal Get-Together will be held Wednesday evening at 8 P. M. And the Convention Banquet with dinner, dancing and entertainment will take place on Thursday evening.

Mrs. R. A. Dimon, chairman of the Ladies Committee, and its other members, Mrs. G. A. Jersey, Mrs. S. S. Johnston, Mrs. Wm. J. Hennessy, Mrs. F. R. Keller, Mrs. H. F. Saylor and Mrs. D. W. Stoner, have arranged an interesting program for the women attending the Convention.

plers' Society To Hold ntion At Pittsburgh 178-19-20

Tuesday—June 18th

Morning—9 A. M.

Second Educational Session, *E. S. Tayler-son*, presiding.

Afternoon—1 P. M.

Registrants are invited to visit any one of the following plants.

In order that the committee may make adequate bus arrangements, it is requested that trip preference be registered at the Plant Visitation desk when registering for the Convention. A ticket good for transportation to and from the particular plant will be issued in the registration book.

Aluminum Company of America Research Laboratories, New Kensington, Pa.

These Research Laboratories are the largest in the country devoted to research work on light metals. Here the visitor will see the largest testing machine of its kind in existence. This machine develops a million pounds in tension and three million in compression. Many other interesting features will be shown.

Carnegie-Illinois Steel Corporation, Pittsburgh, Pa.

One of the large steel producing plants in the Pittsburgh area. The spectacular basic manufacture of steel will be demonstrated.

Jones and Laughlin Steel Corporation, Aliquippa, Pa.

In this plant, continuous electro-tinning utilizes the alkaline type electrolyte. J & L, with the Metal and Thermit Co. pioneered and developed the potassium stannate bath. The strip is plated, the coating fused and oiled and then re-coiled. The coils are cut into sheet lengths, inspected and bundled in another operation.

Standard Steel Spring Co., Coraopolis, Pa.

This is a large plant devoted to the fabrication and full automatic plating of automobile bumpers and bumper bars. This includes copper, nickel and chromium with attendant operations of cleaning, buffing, etc.

Weirton Steel Company, Weirton, W. Va.

Three plating lines, two on tin and the other for plating zinc in strip form, Weirton,



S. S. Johnston
General Chairman



P. A. Dimon
Educational Chairman



Maurice R. Caldwell
Past Supreme President



Carl E. Heussner
Chairman A.E.S. Research Committee



J. L. Wray
Hotel Reservations



Leo J. Schmitt
Registration



W. J. Hennessy
Publicity Chairman



H. F. Saylor
Entertainment and Banquet

with duPont developed the Halogen (acid type) tin bath. A modified zinc sulphate is used in the zinc line. The strip is plated, and in the case of tin, the coating is fused and oiled and the strip is then re-coiled. Cutting of the coil to sheet length, inspection and bundling are a separate operation. The zinc coated strip may be bonderized or not, re-coiled and either shipped as coils or cut to length in another operation.

The companies listed above reserve the right to refuse admittance to any individual whose presence they feel is prejudicial to their interests.

Evening—6:30 P. M.

Job Platers Dinner-Meeting in the Cardinal Room of the William Penn Hotel. A tentative program is as follows:

A Review of Developments in the Job Plating Industry in 1945.

A National Organization of Job Platers.

Mr. R. J. O'Connor, chairman, requests that all planning to attend this affair please make their reservations when registering.

Wednesday—June 19th

Morning—9 A. M.

Third Educational Session, Kenneth Tator, presiding.

Afternoon—2 P. M.

Fourth Educational Session, C. E. Heusser, presiding.

Evening—8 P. M.

Informal Get-Together, Urban Room, William Penn Hotel.

Thursday—June 20th

Morning—9 A. M.

Fifth Educational Session, Ellsworth Candee, presiding.

Afternoon—2 P. M.

Urban Room, seventeenth floor, final business session, election of officers and selection of 1947 convention city.

Evening—7 P. M.

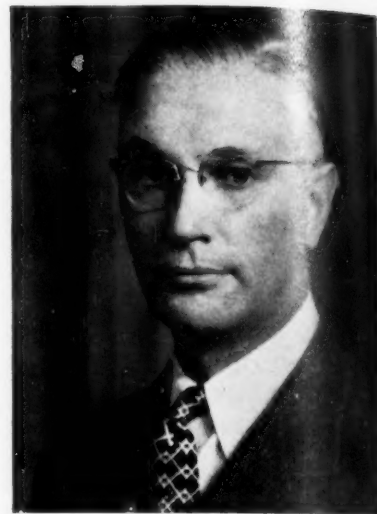
Banquet, stage show, dancing and distribution of awards. Ballroom, William Penn Hotel.

Platers Exhibit

Your attention is most particularly called to the "Hall of Platers' Contribution to the War Effort," in the Adonis Room, 17th floor, William Penn Hotel.

Individual members and local Branches have submitted exhibits of work that they have produced—which in their opinion "Helped Win the War." A corps of informed attendants will be there to explain the exhibits and to answer all questions.

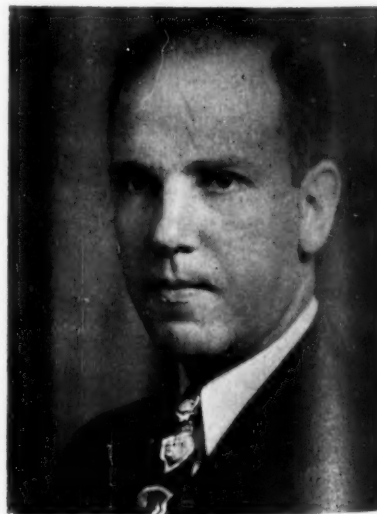
WILFRED S. McKEON, Chairman,
Pittsburgh Exhibits Committee



R. O. Hummel
Transportation



Wilfred S. McKeon
Exhibits



F. R. Keller
Secretary, Treasurer and Assistant Chairman

Educational Program

First Educational Session

Monday Afternoon—June 17th
2:00 P. M.

W. M. PHILLIPS, Chairman
General Motors Corporation

1. "Wartime Plating Developments in England."
By A. W. HOTHERSALL, Woolwich Arsenal, England.
2. "Summary of War Time Research on Plating at the National Bureau of Standards."
By W. BLUM, U. S. Bureau of Standards.
3. "Deposition of Nickel by Chemical Reduction."
By ABNER BRENNER and GRACE E. RIDDELL, U. S. Bureau of Standards.
4. "Purification of Rhodium Plating Solutions."
By ABNER BRENNER and WALTER A. OLSON, U. S. Bureau of Standards.
5. "X-Ray Diffraction Studies of Electrodeposits."
By THEODORE VOYDA, Pratt & Whitney Aircraft.
6. "Electropolishing—What Is Its Status Today?"
CHARLES L. FAUST, Battelle Memorial Institute.

Second Educational Session

Tuesday Morning—June 18th
9:00 A. M.

E. S. TAYLERSON, Chairman
Carnegie-Illinois Steel Corporation

1. "Corroding Wire Screen Cloth Using Radiant Heating."
By J. EDWARD BEMILLER, Hanover Wire Cloth Co., and DAMON C. ANTEL, Standard Steel Spring Co.
2. "Some Observations on Alkaline Electroplating."
By T. G. TIMBY, Jones & Laughlin Steel Corporation.
3. "Tin Plating of Strip Steel at High Speed."
By G. C. JENISON and S. S. JOHNSTON, Weirton Steel Corporation.
4. "Examination of Electro-Cleaned Steel by the Electron Diffraction Technique."
By C. W. SMITH and I. L. KARLE, Detrex Corporation.
5. "Disposing of Plating Room Waste Liquors in Compliance with Stream Pollution Laws."
By C. J. LEWIS, Warner Co.



William Penn Hotel
Convention Headquarters

Third Educational Session

Wednesday Morning—June 19th
9:00 A. M.

KENNETH TATOR, Chairman
Industrial Lining Engineers

1. "The Effect of Surface Preparation on the Durability of Organic Coatings."
By V. M. DARSEY, Parker Rust Proof Corporation.
2. "Evaluation of Organic Finishes."
By EDWARD H. BUCY, Zapon Division, Atlas Powder Co.
3. "Natural and Synthetic Rubber in the Electroplating Field."
By H. C. KLEIN, Goodrich Rubber Co.
4. "Resins of the Vinyl Family in Metal Finishing."
By F. L. SCOTT, Organic Division United Chromium, Inc.
5. "Characteristics of Certain Plastic Films and Coatings."
By J. K. SHACKLETON, Plastics Department, E. I. duPont de Nemours & Co.

Fourth Educational Session

Wednesday Afternoon—June 19th
2:00 P. M.

C. E. HEUSSNER, Chairman
Chrysler Corporation

1. "Research in Electroplating."
By C. E. HEUSSNER, Chairman, A.E.S. Research Committee.
2. "Introduction to Reports of Research Projects."
By R. M. WICK, Chairman, Research Directing Sub-Committee.

3. "Stripping of Copper from Various Base Metals."
By F. C. MATHERS (Indiana University), Director, Project No. 1

4. "Determination of Impurities in Electroplating Solutions."
By E. J. SERFASS (Lehigh University), Director, Project No. 2

5. "Methods for Testing the Adhesion of Electrodeposits."
By A. L. FERGUSON (University of Michigan), Director, Project No. 3

6. "Effect of Surface Finishing of Non-Ferrous Base Metals on Protective Value of Plated Coatings."
By DR. WM. BLUM (National Bureau of Standards), Director, Project No. 4

7. "Present Trends in Legislation Affecting Research and Patents."
By R. C. WATSON, Research Committee Counsel.

8. "Effect of Impurities and Purification of Electroplating Solutions."
By PROF. D. T. EWING (Michigan State College), Director, Project No. 5

9. "The Nature and Effect of Porosity in Electrodeposits."
By DR. N. THON (Princeton University), Director, Project No. 6

10. "Methods of Testing Thickness of Electrodeposits."
By PROF. H. J. READ (Pennsylvania State College), Director, Project No. 7

11. "Polarization at Electrodes in Electroplating Processes."
By PROF. A. L. FERGUSON (University of Michigan), Director, Project No. 8

12. "Closing Remarks."
By C. E. HEUSSNER, Chairman, Research Committee.

Fifth Educational Session

Thursday Morning—June 20th
9:00 A. M.

ELLSWORTH CANDEE, Chairman
American Brass Company

1. "Plating with the Acid Copper Solution."
By GEORGE SCHORE, Atlantic Aircraft Supply Co.

2. "A Periodic Chart for Electroplaters."
By GEORGE DUBERNELL, United Chromium, Inc.

3. "Manodizing and Dye Coloring Magnesium Alloys."
By PAUL R. CUTTER, Hanson-Van Winkle-Munning Co.

4. "Practical Techniques of Polishing and Buffing Compounds and Their Application."
By HOWARD J. MCALEER, Forman Manufacturing Co.

5. "Parkerising: Growth or Shrinkage."
By N. A. TOPE, HUMBER, LTD., England.

Ladies Program

Sunday Afternoon—June 16th

3:00 P.M. Registration, William Penn Hotel.

Monday—June 17th

Morning

9:00 A.M. Registration. A Ladies Registration Center and Staff has been provided for the convenience of guests.

10:15 A.M. The ladies are cordially invited to attend the opening of the Convention and hear the welcoming addresses. The balance of the morning will be open, this will allow the ladies time to get acquainted and plan for future activities.

Afternoon

1:00 P.M. Luncheon and Entertainment for the ladies in the Gold Room of the Roosevelt Hotel. This hotel is located at Sixth and Penn Ave. which is only a few short blocks from the Convention Headquarters.

Evening

9:00 P.M. The International Fellowship Club cordially invites all registrants, men and women, to attend their *Open House*, by ticket only, in the Ballroom of the William Penn Hotel. There will be dancing and entertainment.

Tuesday—June 18th

Morning

10:45 A.M. Visit to the H. J. Heinz Plant. The ladies will meet promptly at 10:45 A.M. in the Grant Street Foyer of the William Penn Hotel. Due to traffic regulations the buses, which will be waiting on Grant St., must leave by 11:00 A.M. Please bring your coupon book. The Pittsburgh plant of H. J. Heinz Company, founded in 1869, is the largest food products establishment of its kind in the world. Luncheon will be served at the plant with the compliments of the company.

Afternoon

Following the luncheon, the ladies will again board the buses and go directly to the Buhl Planetarium and Institute of Popular Science. Gift of the Buhl Foundation to the City of Pittsburgh as a memorial to Henry Buhl Jr., Pittsburgh merchant and philanthropist, this million dollar institution is dedicated to the popular understanding of astronomy and the natural sciences. The Buhl is the fifth of the American Planetaria and the world's most modern and complete. In this "theater of the stars," man is truly master of time and space. The \$134,000 magic star-maker can travel to any point on earth and show the 9000 stars which are

visible to the naked eye. Every celestial event of past or future centuries can be shown with complete realism. Drama of the Universe will thrill you. After the show, the buses will transport the entire group back to Convention Headquarters.

Evening

No formal program has been arranged for this evening in order to permit visitors time to visit the suppliers suites, go to the theatre or otherwise relax. Your committee will be glad to assist in any way. A limited number of tickets to some of the radio broadcasts in Pittsburgh this evening have been reserved for A. E. S. registrants. If you would like to be in the audience at one of these shows, please request tickets from any member of the committee.

Wednesday—June 19th

Morning

The morning hours have been left open for shopping and visits to the many unique places of interest in Pittsburgh; the Civic Center, including the Cathedral of Learning, the museums, a remarkable flower show at Phipps Conservatory, the Fort Pitt Block House and many others. Information regarding these may be obtained at the Ladies Headquarters.

Afternoon

1:00 P. M.—The ladies are cordially invited by David X. Clarin, Aunt Ella's personal secretary, to attend the *Aunt Ella Society* luncheon and party in the Gold Room of the Fort Pitt Hotel. This party is made possible through the courtesy of Oakite Products Company. Ladies are requested to fill in their names and addresses on the ticket provided for this party in order that they may receive a useful gift from the Oakite Company.

Evening

8:00 P. M.—The International Fellowship Club will sponsor a *Bingo Party* under the direction of Joan Trumbour Wiarda. This party will be held in the Cardinal Room of the William Penn Hotel.

Thursday—June 20th

Morning

11:00 A. M.—Breakfast in the Cardinal Room, William Penn Hotel, Seventeenth Floor. A staff-member of the John Powers School will present a talk and demonstration on personality development, "make-down," and kindred arts pertaining to posture appearance and charm. At this session, your committee will have the pleasure of giving each lady an attractive gift as a souvenir of the convention. Please bring your coupon book.

Afternoon Open

Evening

7:00 P. M.—The Annual Banquet, Floor Show and Dance will be held in the Ballroom on the Seventeenth Floor of the William Penn Hotel.



Standing, left to right: Mrs. F. R. Keller, Mrs. D. W. Stoner, Mrs. Wm. J. Hennessy, Mrs. R. A. Dimon, who is Chairlady.

Seated, left to right: Mrs. G. A. Jersey, and Mrs. S. S. Johnston. One member of the Committee, Mrs. H. F. Saylor, was not present when the picture was taken.

International Fellowship Club

Incumbent Officers

Chairman Frederick Gumm
Frederick Gumm Chemical Co., Kearney, N. J.

First Vice-Chairman W. Douglas MacDermid
W. D. MacDermid Chemical Co., Bristol, Conn.

Second Vice-Chairman Robert W. Renton
Lea Manufacturing Co., Waterbury, Conn.

Permanent Secretary T. A. Trumbour
Metal Finishing, New York, N. Y.



Frederick Gumm
Chairman

The *International Fellowship Club* will again play an important part in entertaining the registrants of the A. E. S. Convention in Pittsburgh.

Annual Luncheon

The Annual Luncheon is scheduled for noon on Monday, the first day of the convention, to allow adequate time before the commencement of the educational session, at 2:00 P. M., for a leisurely meal, the election of officers, discussion and final arrangements for the Open House to be held that evening.

Open House

Monday evening, in the Ballroom of the William Penn Hotel, the Fellowship will hold its annual Open House. All registrants, men and women, are cordially invited to attend.

The I. F. C. regrets to announce that, due to circumstances beyond its control, it will be impossible to hold the usual Buffet Lunch-

eon. However, music, dancing and presentation of special awards will take place.

This party is made possible by the generous contributions of firms selling to the plating and finishing industry. These firms and their representatives join the Fellowship in inviting all registrants to attend the Open House.

Ladies Party

Wednesday evening, at 8:00 P. M., the Fellowship will sponsor a party for the ladies registered at the Convention. This affair will be held in the Cardinal Room at the William Penn Hotel. Hostesses will be Mrs. R. A. Dimon and Joan Trumbour Wiarda.

Golf Tournament

Every effort is being made to complete arrangements for a golf tournament, announcement of which will be made at the Convention. All registrants interested are requested to bring golf clubs and equipment.



W. Douglas MacDermid
First Vice-Chairman



Joan Trumbour Wiarda
Hostess



Thomas A. Trumbour
Permanent Secretary



Robert W. Renton
Second Vice-Chairman

SILVERING OF PLASTICS

Practical procedures for commercial production of electrodeposited coatings on plastics to meet new demands in electrical and electronic equipment fields. Costume jewelry an established application of the process.

THE demand for commercial procedures for the electrodeposition of metals on plastics, which have become established upon their merits in widely diversified fields, is increasing daily. The deposition of these various metals on plastics has opened up a large new field in electrical engineering and electronics in addition to the costume and novelty jewelry industries which, at the present time, are utilizing the process with excellent results. Such plated plastics combine all the inherent advantages of the plastic and the required properties of the outer electrodeposited metal. The net result is a combination of a non-conductor and a conductor which promises further wide use in future radio, television and electronic activities.

By plating on plastics, the undesirable properties of the plastics, such as absorption of oils, solvents and moisture, which may cause swelling or distortion of the basis organic material, are eliminated by proper choice and thickness of the outer layer of metal. The weatherability of the plastic is greatly increased. Experiments¹ show a marked increase in tensile, impact and flexural strength for many synthetic resins when plated as compared with values for the same resins unplated. An appreciable increase in resistance to distortion from heat and a decrease in percentage of water absorption are obtained by complete envelopment of the plastic in a suitable metallic coating. However, the most important advantage of plating on plastics is the greater corrosion resistance of a metallic deposit when it is applied to a plastic base than to the usual metallic base since there are no galvanic couples with a basis metal.

Advantages of Chemical Reduction Method

To render the plastic surface conductive, the methods using fine metal powders in a lacquer or varnish medium, metal spraying, cathode sputtering and metal evaporation have proven successful in specialized cases but were found inadequate for the majority of production methods in industry. On the other hand, the chemical reduction method described in this section is best adapted to an economical production set-up.

The main advantages of the chemical reduction method, especially the procedure using precipitated silver films, are (1) the silver film, in forming, covers the entire surface of the plastic regardless of its size or shape so that proper contact is immediately established over the entire surface; hence, instant plating takes place and the same thickness of metal results at every point on the surface; (2) the thickness of

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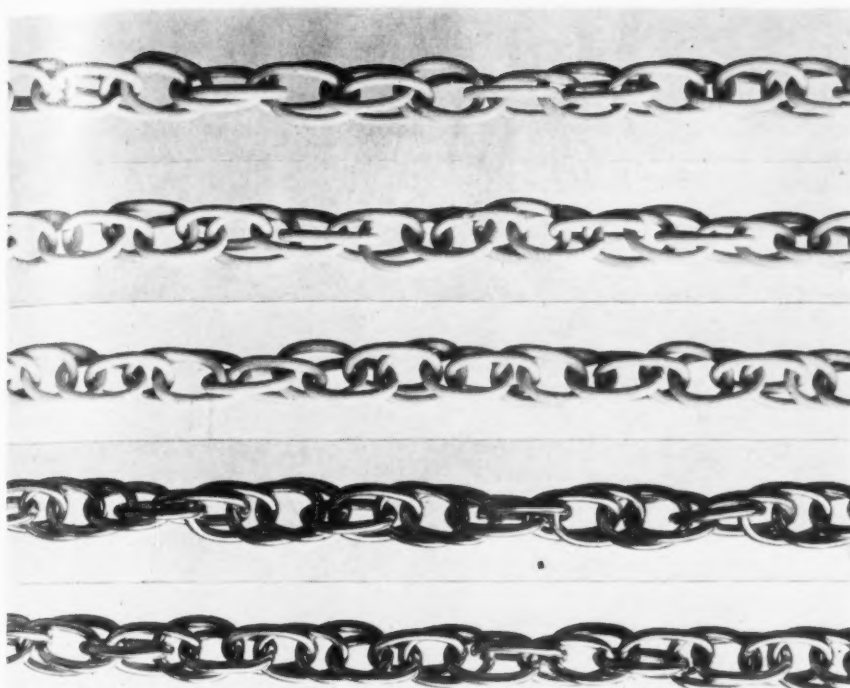
the very thin silver film can be controlled so as to permit subsequent electrodeposition of an outer metal in accurately determined magnitudes; (3) the fine details of certain specially-designed plastic parts are exactly reproduced or maintained, and (4) costly equipment and special techniques are not required.

Details of Chemical Reduction Method

There are numerous methods described in both the trade journals and patent literature²⁻⁹ for producing a conductive film on plastics for subsequent electrodeposition. In general, they accomplish the same result, namely, chemical reduction on a properly prepared plastic surface producing a highly conductive and reasonably adherent metallic film. A typical example includes use of an ammoniacal silver nitrate solution with a suitable organic reducing agent followed by a deposit of copper, silver or lead as an intermediate layer and, finally, a top layer of the desired metal such as chromium, nickel, gold, silver, cadmium, zinc or iron.

The preparatory treatments of the plastic surface are the governing factors which make for the success or failure of any process for "silvering" plastics since the chemical structure of the plastic determines the procedure to be employed for the application of the conductive film. The different types of plastic substances do not receive the same preparatory treatment. Some methods are applicable to one type of plastic while for another type they may be harmful and cause attack, excessive swelling, or even disintegration. The differences lie in the "de-glazing" of the hard plastic surface, its cleaning and so-called "sensitizing" (making the plastic surface more receptive to the conductive film to be formed thereon).

The following examples may be cited. Plastics such as the phenolics, ureas, cellulose nitrates, styrenes and methyl methacrylates are given a slight "de-glazing" operation before cleaning and "sensitizing" while cellulose acetates undergo a "priming" operation prior to "sensitizing" before the surface is highly receptive to a continuous, adherent silver film. Rubber compounds are prepared for metallizing¹⁰ by immersion in benzol or acetone for roughening after which they are cleaned in a mild cleaner and "sensitized". Casein plastics



Original molded plastic chain (cellulose acetate).

Chain wet-tumbled three hours in 20½ pumice and water.

Chain silvered (0.000006\" silver).

Copper-plated in acid-copper bath (.004\" copper).

Finished gold-plated chain.

use water as the swelling agent or "roughener" prior to their preparation to receive the silver film.¹¹ Urea-formaldehyde resins are roughened in 10% hydrochloric acid and treated in a 1% ammoniacal ferrous sulfate solution for 15 minutes at 30° C. They are then placed in a 2% copper sulfate solution for 3 minutes at 30° C.¹²

In general the formation of a suitably conductive and reasonably adherent silver film on a plastic surface involves the following steps:

- (1) Slight roughening or "de-glazing" of the plastic surface.
- (2) Cleaning the surface.
- (3) "Sensitizing" the surface.
- (4) Formation of the silver film by chemical reduction.

The electrodeposition of an intermediate layer of copper, silver or lead and the application of the desired outer layer of metal then follows.

Roughening—"De-glazing"

This procedure has two fundamental purposes: (1) to roughen the surface slightly or to remove glaze from the plastic article as it comes from the molding operation; and (2) to remove the "flash" or feather-edge from the molded piece. This operation is usually performed by (1) wet-tumbling in a mixture of 20½ pumice and water; (2) air-blasting with 220 mesh grain aluminum oxide, or (3) etching the part chemically. The surface preparation procedure used depends upon the size, shape and number of pieces to be treated and the chemical structure of the plastic. If the parts are small in size, the wet-tumbling procedure is employed, using tumbling barrels rotating at 40-50 revolutions per minute for one to five hours, depending upon the intricacy of the piece. Larger pieces are "de-glazed" with the aluminum oxide blast in the conventional type of blast cabinet.

Chemical roughening methods must be used with extreme care so that the etchant will not cause too severe an etching action. Plastics of the phenol-formaldehyde and urea-formaldehyde types as well as the cellulose esters can be treated in the usual acid bright dip solution (sulphuric-nitric-hydrochloric acid mixture) provided the excess acid is immediately rinsed away and the parts are immersed in a neutralizing solution such as a 10% sodium carbonate solution. Treatment for one to five minutes in a 5% to 10% sodium hydroxide solution may be used for etching plastics of the cellulose ester group; also organic reagents such as a 10% acetone solution.

Cleaning the Surface

The surface of the plastic must be freed from any greasy film, finger-marks or contamination following the roughening operation, otherwise a non-adherent and mottled silver film may result. Mild proprietary cleaners such as those employed for cleaning non-ferrous metals suffice in the majority of cases. Carbon tetrachloride or solutions of trisodium phosphate, or wetting agents, or mild caustic soda solutions may also be used. However, the chemical structure of the plastic material must be considered, in order to avoid chemical reaction between the cleaning agent and the plastic surface. Elevated temperatures may be used in cleaning provided these temperatures do not approach the distortion point of the plastic.

The plastic piece should be thoroughly rinsed in water after cleaning and not allowed to dry prior to the next step in the preparation of the plastic surface for receiving the subsequent silver film.

"Sensitizing"

The most important step in the preparation of the plastic surface to receive a continuous and adherent metallic film

that is capable of carrying current is the "sensitizing" treatment.

The "sensitizing" treatment is best applied by immersion of the plastic part for one to two minutes in an aqueous solution of the agent. The reagent used must be thoroughly washed away with water, since incomplete removal results in a mottled, poorly adherent metallic silver film.

Freund¹³ uses a solution of the following formulation:

Sulphuric acid (66° Bé)	100 cc.
Potassium dichromate	15 grams
Water	25-30 cc.

Weiss¹⁴ suggests immersion for 1/2-1 hour in a mixture made up of the following chemicals:

Stannous sulfate	25-40 grams
Sulphuric acid (66° Bé)	5-20 cc.
Ethyl alcohol	150-250 cc.
Quinol	5-15 grams
Water	600-1000 cc.

Walker¹⁵ recommends a solution of the following composition:

Stannous chloride	360 grams
Hydrochloric acid (C.P.)	216 cc.
Water	4000 cc.

Some prefer a more dilute stannous chloride solution represented by the formula:

Stannous chloride	10 grams
Hydrochloric acid (C.P.)	40 cc.
Water	1000 cc.

Formation of the Silver Film

The conductive silver film is produced on the properly cleaned and "sensitized" plastic surface by chemically reducing an ammoniacal solution of silver nitrate by means of a reducing agent. Bureau of Standards Circular #389 (1931)¹⁶ summarizes three methods for producing silver films or mirrors on glass which work equally as well on organic plastics. However, in commercial applications, the following modified formulation, using formaldehyde (40%) as the reducing agent, is being employed with excellent results:

Ammoniacal Silver Nitrate Solution

Silver nitrate (C.P.)	60 grams
Distilled water	1000 cc.
Ammonium hydroxide (28%)	60 cc.

Reducing Solution

Formaldehyde (40% by volume)	65 cc.
Distilled water	1000 cc.

Although complete details for making up the ammoniacal silver nitrate solution are found in the previously mentioned governmental circular it would be well to review the procedure briefly since the amount of free ammonia in this silvering solution is most important. A relatively small excess of ammonia will prevent any deposition of silver on the plastic surface while too little ammonia will result in an excess of precipitated oxide which is undesirable.

The 60 grams of C.P. Silver Nitrate are dissolved in 1000 cc. completely and the concentrated ammonium hydroxide added with constant stirring. The precipitate first formed will redissolve when the entire amount of ammonium hydroxide is added. The resulting solution, after 60 cc. of con-

centrated ammonium hydroxide has been added will contain the proper amount of free ammonia for a suitable silvering solution. It must be stressed that only concentrated ammonium hydroxide (28%—Sp.Gr. 0.90) should be used in the above formulation. If the strength of the ammonium hydroxide has decreased upon standing a proportionate amount more must be used in the formula.

The reducing solution is made by adding 65 cc. of formaldehyde (40% by volume) to 1000 cc. of distilled water. Here again, if the strength of the formaldehyde has lessened a proportionate increase in the amount of formaldehyde must be employed.

The plastic parts, after being properly prepared, if in bulk, are "bonded" or "silvered" by placing them in an inclined rubber or synthetic lined container rotating at 45 revolutions per minute with enough water to completely cover the pieces. The container is best to possess ribs on its inner wall and bottom to insure against mass rolling of the parts which results in partial silvering. The proper volume of the freshly prepared ammoniacal silver nitrate solution is then added and an equal volume of the formaldehyde reducing solution. The quantity of the silvering solution required depends upon the total surface area of the work being "bonded" keeping in mind that the container's inner surfaces will also utilize some of the available silver. Larger pieces, not suitable for bulk handling as described are treated on racks or, in some cases, are sprayed with the silver and reducing solutions simultaneously hitting their surfaces through a specially-designed dual spray gun.

The "silvering" treatment continues until all the silver has been precipitated from the ammoniacal silver nitrate solution. This point may be determined by removing a sample of the "bonding" mixture and testing for precipitation of silver chloride with a 10% sodium chloride solution. The "bonding" operation usually requires 20 to 30 minutes to produce a silver film capable of carrying current to receive an electrodeposit of the intermediate layer of metal. A suitable silver film can be tested with an ohmmeter for conductivity or with a flashlight bulb connected in series with two test prods and a dry cell.

Following the "bonding" treatment the parts are rinsed thoroughly and allowed to dry preferably overnight or by a hot air blast.

The intermediate layer of metal is best applied from the conventional type of acid copper plating bath. This deposit, after bright-dipping, buffing or tumbling is then ready for the desired final coat of metal.

Bibliography

1. H. Narcus. Trans. Electrochem. Soc., **88**, Preprint 5 (1945).
2. J. Electrodepositors' Tech. Soc., **17**, 1-10 (1941).
3. S. Wein. Metal Finishing, **42**, 669-72, 736-38 (1944).
4. U. S. Patent #2,063,034 (December 8, 1936).
5. U. S. Patent #2,303,871 (December 1, 1941).
6. U. S. Patent #2,325,528 (December 24, 1942).
7. U. S. Patent #2,355,933 (August 15, 1944).
8. U. S. Patent #2,010,805 (August 13, 1935).
9. British Patent #296,459 (September 3, 1928).
10. N. Hall and G. B. Hogaboom, Jr. Plating and Finishing Guide-book, p. 102 (1942).
11. See (8).
12. Simond & Ellis. Handbook of Plastics, pp. 58-149 (1943).
13. See (4).
14. See (7).
15. See (5).
16. U. S. Department of Commerce, January 6, 1931.

Common Plating Bath Troubles

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A PLATING process, to be acceptable to the trade, must ensure continuous quality production by test, by observation or by analysis.

Experienced platers reduce the essential control methods for their plating baths to a minimum by adjustment of the anode area in order to maintain proper metal balance in solution, by periodic additions to the baths based on the amount of work processed and by observation of the appearance of the finished product.

Cyanide zinc baths for example, have been successfully operated in this fashion for years with the aid of frequent "on the spot" analyses for total cyanide and an occasional complete analysis by an outside laboratory. Through correlation of these tests with production results, the plater adds facts to his experience which enable him to operate at maximum efficiency.

A less experienced plater would require frequent analyses of all the important bath constituents as well as operating instructions explaining the meaning of the analyses and placing limits of all variables requiring control. However, by providing analytical facilities and specifying narrow bath limits in the operating instructions, it is possible for a plating engineer to set up a process that can successfully be operated by men with relatively little training.

Although there is considerable difference in the methods of these two means of operation, the same quality of plate may be obtained in either case and each process has proven satisfactory.

It is rare that all analyses may be eliminated from a process, but in some cases such as the cyanide zinc bath, a plater may never analyze for free caustic and yet he may control it by adding caustic in a definite ratio to the cyanide added, where the cyanide is controlled by analysis.

In the best controlled process, inferior plating will occasionally be obtained as the result of a variable that is not or cannot be controlled or foreseen.

A condition such as a porous basis metal may give rise to a blistered plate. Partially decomposed coolant oil, due to a change in rolling practice at the steel mill, may produce a surface that cannot be cleaned by established practice.¹ Poor plate adhesion from freshly prepared baths may be the result of impurities accumulated in the chemical processing of the plating salts. A rough plate may be caused by suspended solids carried over from the anode sludge, from dirt in the air or from precipitation of compounds in the bath. The deposit may blister or fail to cover due to improper or inadequate cleaning.

The part to be plated may fail to cover due to improper anode spacing or arrangement, or to poor rack design. The plate may suddenly develop spots that can be due to such a variety of reasons that they may only be corrected through specific knowledge of previous troubles of the same sort or by extensive experimentation.

These common troubles are not readily measurable but are generally detected and controlled by inspection of the finished product.

In case of unexpected troubles, a check may first be made of all controllable limits. If all limits are under control, a check may be made on the cleaning line, as a variety of troubles are caused by poor cleaning. A variable that does not show up on analysis such as excessive oil in the cleaner, may easily be the offender. It is usually possible to by-pass the cleaner tank by hand cleaning a few pieces with solvent, followed by a mild abrasive paste and confirm or eliminate trouble at this point or in the pickle by a similar procedure. If the plate is rough, filtration is in order and a rapid check may be made on a small portion of the bath on laboratory scale before and after filtering.

If impurities in the bath are suspected, a purification step may be tried.

Low current density electrolysis such as is commonly used for nickel baths² may remove metals. Other chemical purification steps can be taken depending on the bath and the impurity suspected. In some cases, it is customary to analyze for and describe limits for tolerance of known impurities such as iron in a nickel bath.³

These general troubles are well known to platers but the specific troubles found through misfortune and experiment are the offenders that interest us most. Some indications of these are given in the following tables although, of course, it is impossible to know or record a complete list.

The bath troubles listed are taken from the literature,⁴ from private sources and from experience. In most cases, the troubles were listed only where the same effect was agreed on by more than one source. In many cases no remedy was suggested.

The tables of general troubles do not apply to any particular bath, but are common in many cases.

General Bath Troubles

OFF COLOR DEPOSITS

1. *Analysis:* Make a complete analysis of the bath and adjust all ingredients to the proper chemical limits.

2. *Thin Deposits:* Plate a heavy deposit to determine if coverage is adequate to produce the desired color.

3. *Metal Impurities:* Purify by low current density electrolysis or by chemical treatment. Remove the solution from the tank, examine for parts dropped in the tank, for dirt and for electrical faults. Clean the tank and filter the solution into it.

BLISTERED DEPOSITS OR POOR ADHESION

1. *Cleaning and Pickling:* By-pass these steps by using separate tanks or hand cleaning. Examine the part for oil or grease not removed by ordinary cleaning methods.

2. *Fresh Baths:* Very often, deposits from a fresh bath

will have poor adhesion, but this trouble will gradually disappear if the bath is electrolyzed for a period of time to remove impurities sometimes present in commercial salts.

3. *Basis Metal*: Examine the basis metal for cracks or holes that may trap solution in the cleaning steps and prevent proper plating.

4. *Strike Baths*: Very often, the addition of a strike step will overcome poor adhesion. A Rochelle copper bath is often used for this purpose.

ROUGH DEPOSITS

1. *Suspended Material*: Suspended solids in a bath often cause rough deposits. These may be removed by filtering.

2. *Poor Anode Corrosion*: If the anode corrodes so that particles of metal form a loose film on the surface of the anode, it is quite common for these particles to be carried to the cathode and cause a rough deposit. Filter the bath and bag the anodes.

3. *Dirt on the Work*: Often particles such as grinding compound, small particles of rubber or various particles of material such as those used in previous process steps are not removed by the ordinary cleaning steps. Hand clean the work with a mild abrasive such as magnesium oxide until no discoloration can be obtained after wiping with a clean cloth.

4. *Overplating*: Some baths such as a cyanide copper bath will invariably produce rough deposits for thicknesses of the order of three thousandths of an inch or greater.

5. *High Current Density*: Many baths, particularly the acid types, will plate rough if operated at too high a current density. Cathode agitation permits the use of higher current densities.

6. *Low Metal Content*: Operation at normal current densities with low metal content will give an effect similar to operation at high current densities with normal metal content. Agitation will help but addition of metal is more satisfactory.

7. *Agitation*: If agitation is used during plating such as in the high efficiency cyanide copper process, frequent or continuous filtration, is necessary, since impurities that would normally settle to the bottom of the tank will be suspended by the resulting solution agitation.

8. *Impurities*: If impurities are suspected, they can only be found by previous experience or investigation. The important fact is that impurities have to enter the bath from some direct contact source so that drag-in, chemical-used, water used, anodes, the plating atmosphere and the work itself may all be suspected. Very often the parts plated, such as zinc-base die castings, may corrode to some extent before they are covered and eventually cause trouble. Racks that are used for plating in more than one type of bath may easily cause contamination.

SPOTTY DEPOSITS

Spotty deposits are sometimes caused by poor cleaning and occasionally by pick-up of oil that has accumulated on the surface of the cleaner.

POOR ANODE CORROSION

1. *Impurities in Anode*: Specify anode purity.
2. *High Anode Current Density*: Increase the anode area.

3. *Impurities in Bath*: Purify bath and analyze for excessive accumulation of chemicals such as carbonate in alkaline baths.

4. *High Metal Content*: If the metal content is high, the concentration of metal close to the anode readily becomes excessive on electrolysis.

LOW FREE ACID

If acid is low or a buffering acid is low in a high pH acid bath, the free acid is readily used up at the anode.

LOW FREE CYANIDE

Same effect as low free acid.

LOW CATHODE EFFICIENCY

1. *Low Metal Content*: If the metal content is low, the ability for hydrogen to deposit is greatly increased.

2. *High Free Cyanide*: Excessive amounts of cyanide will lower the cathode efficiency in many of the cyanide baths.

3. *Impurities*: Many cases of lowering of cathode efficiency by accumulation of impurities are known, but no general rule can be stated.

In some cases, the accumulation of ammonia in cyanide baths due to decomposition of the cyanide will lower the cathode efficiency. This can be remedied temporarily by heating the bath to drive off ammonia.

HIGH METAL CONTENT

Excessive anode area often leads to build up of metal in the bath.

PLATE DISTRIBUTION

1. *Recesses*: In general, the acid baths are poor in throwing power, and the alkaline baths good. In case difficulty is experienced in plating in recesses, the location of the anode and the design of the rack should be considered. By allowing the anode to extend into a recess better covering may be obtained.

2. *Corners and Edges*: A bath that will not plate in recesses will also be a bath that will build up a deposit on corners and edges. This effect may be partially overcome by robbing the high current density areas through the use of auxiliary cathodes near these areas or by the use of non-conducting material between this area and the anode to shadow these areas. Each case is a separate problem that must be solved by experience and experiment although some general theoretical principles are available.⁵

Brass

The following specific troubles are not complete and do not apply in every case, but they indicate what may occasionally occur in each typical bath.

TYPICAL BATH COMPOSITION⁶

	g./L.	oz./gal.
Copper cyanide	30.0	4.0
Zinc cyanide	9.4	1.25
Sodium cyanide	56.3	7.5
Sodium carbonate	30.0	4.0

Since brass is an alloy bath, the effect of a given variable cannot be stated with surety since copper may tend to plate more readily from one bath and zinc from another. The metal that tends to deposit more readily is known as the

noble metal to the alloy plater and it may be decreased by increasing the current density. For the typical bath composition given, an increase in current density will decrease the percentage of zinc in the deposit, but for another composition, the opposite effect may be attained.⁷

PINK OR RED DEPOSITS

This condition is a result of the deposit containing too high a percentage of *either* zinc or copper. If the trouble is due to high copper content, it may be corrected in a number of ways depending upon the condition of the bath.

1. By lowering the bath temperature.
2. By adding caustic to raise the pH.
3. By lowering the current density.
4. By adding zinc cyanide.
5. By adding both zinc cyanide and copper cyanide to lower the free cyanide content.

Reddish deposits due to a high zinc content may be remedied as follows:

1. By raising the bath temperature.
2. By adding sodium bicarbonate to lower the pH.
3. By raising the current density.
4. By adding copper cyanide.
5. By adding alkali cyanide to increase the free cyanide content.

OFF-COLOR DEPOSITS

Addition of small amounts of ammonia or ammonium salts may temporarily correct this condition.

WHITE OR GREY DEPOSITS

Excessive amounts of arsenic or nickel in the bath will cause this trouble. Electrolysis is the most satisfactory method of removing or reducing the content of these contaminating metals.

DULL-DARK DEPOSITS

Lead contamination which is best corrected by electrolysis.

POOR ANODE CORROSION

The presence of tartrates or citrates and a low free cyanide content result in poor anode corrosion.

Cyanide Cadmium

TYPICAL BATH COMPOSITION⁸

	g./L.	oz./gal.
Cadmium oxide	23-39	3-5.2
Cadmium metal	19-34	2.5-4.5
Sodium cyanide	86-131	11.5-17.5

The cyanide cadmium bath is susceptible to deleterious effects due to metallic impurities because of the tendency of many metals to deposit readily from this electrolyte. This means that these impurities must be kept from the bath by using high purity anodes,⁹ and it also means that the impurities may usually be removed by electrolysis at low current density or by the addition of cadmium sponge.

Most cadmium baths are operated to give bright deposits through the use of addition agents.

DULL DEPOSIT

1. *High Metal Content:* Electrolyze with steel anodes or add cyanide to reduce the concentration of metal ions.
2. *Low Cyanide:* Add sodium cyanide.

3. *High Carbonate:* Remove carbonate by freezing or precipitation as calcium carbonate.¹⁰

4. *High Caustic:* Add cadmium cyanide in place of cadmium oxide.

BURNT DEPOSIT

This condition is caused by poor plating in high current density areas and, in general, is due to conditions causing a low cathode current density. Usually it is caused by a low metal content.

NON-UNIFORM DEPOSIT

A small amount of sodium carbonate is said to be beneficial to operation of the bath. Hull¹¹ recommends limits of 2 to 6 ounces per gallon. Low carbonate may cause non-uniform deposits.

SLATE COLORED OR STREAKED DEPOSITS

Lead, copper, silver, antimony, thallium and tin may cause inferior deposits. These metals may be removed by electrolysis or by precipitation with cadmium sponge followed by filtering of the bath.

PITTED DEPOSITS

In this case, the caustic content should be checked. If it is low, it may cause pitting. If this does not correct the trouble, the cleaning and pickling steps may require improvement.

BRITTLE DEPOSIT

Hydrogen embrittlement due to overpickling.

POLARIZED ANODES

At high anode current densities, the anodes become black, powdery and begin to evolve oxygen. This undesirable condition leads to difficulties in bath control and in some cases to a rough deposit from the following causes:

1. *High Anode Current Density:* Increase the anode area.
2. *Low Caustic:* Add caustic soda.
3. *Low Cyanide:* Add sodium cyanide.
4. *High Carbonate:* Remove carbonate by crystallization or precipitation.

UNEVEN DISSOLUTION OF ANODES

This condition may be caused by the accumulation of insoluble impurities on the surface of the anode and can only be overcome by use of high purity anodes.

IMMERSION PLATING ON ANODES

Contamination of the bath by metals more noble than cadmium may result in immersion plating on the anodes. These metals may be removed by electrolysis at low current density or by precipitation with cadmium sponge.

HIGH BATH VOLTAGE

1. *Polarized Anodes:* See foregoing.
2. *Poor Bath Conductivity:* Usually due to low caustic in the bath.

LOW CATHODE EFFICIENCY

1. *Low Metal:* Add cadmium oxide.
2. *High Cyanide:* Add cadmium oxide to the bath.

Chromium

TYPICAL BATH COMPOSITION¹²

	g./L.	oz./gal.
Chromic acid	250	33.3
Sulfuric acid	2.5	0.33

The chromic acid plating bath is notable for its poor throwing power and parts to be plated should be arranged in the bath or on a plating rack so that the best possible current distribution is obtained. If this fact is kept in mind along with the facts that the solution is highly corrosive and more current is required than in most plating baths, very little trouble will be experienced.

NARROW PLATING RANGE

This can be caused by either too high or too low a $\frac{\text{CrO}_3}{\text{SO}_4}$ ratio. If the ratio is appreciably low, the deposit will assume a greenish-yellow tinge while if the ratio is high, additions of catalyst acid radical will result in a further decrease in the plating range.

THIN DEPOSITS—LOW EFFICIENCY

Both temperature and $\frac{\text{CrO}_3}{\text{SO}_4}$ ratio are associated with plating rate and coverage. At a constant current density, the plating rate decreases as the temperature is increased.

MILKY-STREAKED DEPOSITS

This condition is usually caused by too low a current density.

DULL-MATTE DEPOSITS

A low operating temperature will give this type of plate.

BURNED-NODULAR DEPOSITS

Current density is too high.

POOR BATH CONDUCTIVITY

Bath contaminated with iron, copper, zinc, etc.

TRIVALENT CHROMIUM BUILDUP

The use of iron or steel anodes will result in a higher equilibrium concentration of trivalent chromium than when the conventional lead or lead alloy anodes are used. This build-up can also be caused by too small an anode area, using lead or lead alloy anodes, as an insufficient surface area of lead peroxide is present to reoxidize the chromium which is reduced at the cathode.

Acid Copper

TYPICAL BATH COMPOSITION¹³

	g./L.	oz./gal.
Copper sulfate	150-250	20-33
Sulfuric acid	45-100	6-13

The acid copper bath is easy to operate and control, but is not likely to replace the cyanide copper bath because no commercial bath yielding bright deposits is available and because a copper strike is required to obtain adhesion on basis metals such as steel or zinc alloys.

HARD DEPOSITS¹⁴

1. *Low Metal Content:* Add copper sulfate.
2. *High Acid:* Add copper carbonate.

3. High Current Density.

4. Low Temperature.

TREED DEPOSITS

This condition indicates insufficient addition agent. Add glue.

NON-UNIFORM DEPOSITS

Deposits of this type are sometimes obtained due to the presence of organic material. Such material is usually colloidal and, if troublesome, may be removed by treatment with activated carbon followed by filtration.

EXCESSIVE COPPER SULFATE IN BATH

This condition indicates that the anode area is too large and it should be reduced to approximate the cathode area.

ROUGH DEPOSITS

1. *Suspended Solids.*
2. *Anode Particles:* Use rolled copper anodes.

Rochelle Copper

TYPICAL BATH COMPOSITION¹⁵

	g./L.	oz./gal.
Copper cyanide	26	3.5
Sodium cyanide	35	4.6
Sodium carbonate	30	4.0
Rochelle salt	45	6.0

This type of bath or similar low efficiency copper cyanide baths are frequently used as an undercoat for other deposits to promote adhesion. It may, therefore, be regarded as a process bath or one that is used as a step in a plating process where another metal is deposited over the copper, but where the process would fail in many cases if this step were not included.

DULL DEPOSITS

This condition is usually caused by one or more of the following:

1. *Low Free Cyanide Content.*
2. *Low Rochelle Salt Content.*
3. *High Carbonate Content:* Can be lowered by either crystallization or precipitation.

BURNT DEPOSITS

Baths containing very high free cyanide will give this result under normal operating conditions. Immediate correction is obtained by adding copper cyanide and then replacing some of the steel anodes with copper anodes in order to prevent metal depletion with consequent free cyanide buildup.

NON-UNIFORM DEPOSITS

Non-uniformity is usually caused by:

1. *Low Free Cyanide.*
2. *Low pH.*

ROUGH DEPOSITS

1. *Suspended Material in the Bath.*
2. *High pH.*

BRASSY IRREGULAR DEPOSITS

Zinc contamination. The zinc can be removed by electrolysis or by precipitation with sodium sulfide although an excess of sulfide may cause non-uniform deposits.

DARK DEPOSITS

Lead Contamination: Very small amounts of lead act as brighteners or crystal refining agents while larger amounts cause the deposit to become dark and smutty. The lead can be removed by precipitation as sulfide or by electrolysis.

LOW CATHODE EFFICIENCY

A low overall concentration, high Rochelle salt content or very high free cyanide all tend to lower the cathode efficiency.

POLARIZED ANODES

This may be overcome by the use of iron and copper anodes as the iron tends to depolarize the copper. A very low carbonate content also tends to favor this condition.

POOR ANODE DISSOLUTION

One or more of the following may cause this trouble:

1. *High pH.*
2. *High Carbonate.*
3. *High Anode Current Density.*

IRON ANODES CORRODED

The carbonate content of the bath should be maintained within specified limits to prevent corrosion of the iron anodes.

BLUISH CAST TO SOLUTION

Cupric ions give this color indicating little or no free cyanide.

(To be continued)

References

1. E. H. Lyons, *Trans. Electrochem. Soc.*, **80**, 367 (1941).
2. Weisberg, *Metal Ind. (N. Y.)*, **34**, 451 (1937).
3. Madsen, *Trans. Electrochem. Soc.*, **45**, 249 (1924).
4. Many of the troubles are described in Vol. 80, *Trans. Electrochem. Soc.* and in the *Plating and Finishing Guidebook*.
5. C. Kasper, *Trans. Electrochem. Soc.*, **77**, 353 (1940).
6. G. B. Hogaboom, Jr. and N. Hall, *Plating and Finishing Guidebook*, p. 13 (1945).
7. Ferguson & Sturdevant, *Trans. Electrochem. Soc.*, **38**, 167 (1920).
8. G. Soderberg and L. R. Westbrook, *Trans. Electrochem. Soc.*, **80**, 431 (1941).
9. G. Soderberg, *Monthly Rev., Am. Electroplaters' Soc.*, **19**, 9 (Feb. 1932).
10. R. O. Hull, U. S. Patent 2,164,924.
11. R. O. Hull, *Plating & Finishing Guidebook*, p. 17 (1945).
12. G. Dubernell, *Trans. Electrochem. Soc.*, **80**, 589 (1941).
13. J. H. Winkler, *Trans. Electrochem. Soc.*, **80**, 521 (1941).
14. Soft deposits are not always desirable.
15. A. K. Graham & H. J. Read, *Trans. Electrochem. Soc.*, **80**, 341 (1940).

Buffing Small Parts

By H. MOORE

Yorkshire, England

ALTHOUGH a semi-polished surface is reasonable for certain kinds of work the appearance of most articles is spoiled if polishing stops short at the minor details. Carelessly finished nuts, washers, screw heads, pins and hooks are typical examples of the kinds of components indicated. The difficulty of holding small pieces is responsible; that, and a mistaken view of the importance of these things in relation to the whole.

Without pretending superior knowledge in the presentation of his own ideas on the subject, the writer feels, nevertheless, that his methods should arouse a lively interest, by reason of the novelty shown in the choice of materials and the simple manner of adapting them for special needs. In order to avoid lengthy and perhaps confusing description, only those articles known to everyone will be included. Mass production, of course, finds no place in an article of this kind. The procedures which follow are for the small lots which plague the operator at irregular intervals.

Every polisher knows what a round head screw looks like. Buffing the heads of these when the body is short is an uncomfortable operation. For one thing only the thumb and two fingers can be used to hold them against the action of the buff, besides which they soon become hot and the fingers end sore from accidental contact with the buff. The quickest holder we have found for these, and worth making even when only a few are to be done, is a piece of old leather belting about twelve inches long, with a knife slit about three inches long lengthwise in the middle, near one

end. Push the screw through the slit and pull it towards the end of the belt as far as it will go. Then grasp the protruding screw body between the right thumb and fingers and the other end of the belt in the left hand. Now, when the screw head is pressed into the buff, the fingers are protected by the belt, the screw does not heat so quickly and the other hand is available to resist the force of the whirling wheel.

Pliers, as they are, do not constitute a valuable asset to the polisher, but they can be adapted for holding pins and the like by grinding a shallow groove in the jaws from back to front or by gripping the pin with something else—a piece of lead or leather. The idea in both cases is to prevent the pin from swinging sideways when the end is being buffed.

To polish the edges of a few washers without losing some of them in the process they should be threaded on a piece of string and tied as tightly together as possible. This allows them to be polished together, the tightened string can be moved around for this purpose. There are better ways of holding washers than this, of course, but none that can be improvised more quickly.

Staples and similar U-shaped pieces are difficult to handle singly. One convenience, reducing the difficulty to a minimum, is a flat piece of wood with an edge rounded off to the same radius as the job. This should be a good press fit and several at the same time should be polished with the ends always downward. By pressing well into the wheel the work will be polished all over with the exception of the negligible portion in contact with the wood.

Odd washers, rings, nuts, can be held on a three cornered file, the tang end of a file, or a piece of taper sharpened wood. If the faces of small washers need to be polished, drive a nail into a piece of flat wood until the head sticks

(Concluded on page 253)

The Electrodeposition of Nickel-Cobalt-Tungsten Alloys from an Acid Plating Bath

By PAUL F. HOGLUND¹ and M. L. HOLT²

Introduction

THE work reported in this paper is a continuation of a study, in progress in this laboratory, concerned with the electrodeposition of tungsten alloys from aqueous plating baths. Previously, the electrodeposition of alloys of tungsten with nickel,³ with iron,⁴ and with cobalt⁵ has been reported. In all of these cases the tungsten-alloy plating baths were prepared by adding a soluble tungstate, such as sodium tungstate, to regular metal plating baths.

The electrodeposition of nickel-cobalt alloys has attracted some attention in the past few years since it is claimed that such deposits have a greater resistance to corrosion than either of the single metals. The successful electrodeposition of nickel-tungsten and cobalt-tungsten alloys suggested the possibility of electrodepositing ternary alloys of nickel, cobalt and tungsten. The purpose of this present research was to study the electrodeposition of nickel-cobalt-tungsten alloys from plating baths prepared by adding sodium tungstate to regular nickel-cobalt plating baths. It was also expected that this additional information on the electrodeposition of tungsten-containing alloys would perhaps contribute to a better understanding of the mechanism of the cathodic reduction of tungstates in aqueous solutions.

Experimental

PREPARATION OF THE PLATING BATHS. Several different plating baths have been suggested for the electrodeposition of nickel-cobalt alloys, but only the Fink and Lah⁶ and the Weisberg⁷ baths were used in this work.

The Weisberg bath prepared for these studies had the following composition: $\text{NiSO}_4 \cdot 6\text{H}_2\text{O}$, 240 g./L; $\text{NiCl}_2 \cdot 6\text{H}_2\text{O}$, 40 g./L; nickel formate, 45 g./L; boric acid, 30 g./L; $\text{CoSO}_4 \cdot 7\text{H}_2\text{O}$, 12 g./L; ammonium sulfate, 2 g./L; and formaldehyde (37%), 1 ml./L. All chemicals used were regular reagent quality except the nickel sulfate which was technical grade purified by the method of Macnaughtan and Hotherhall.⁸

The Fink and Lah bath was modified somewhat to make it resemble more closely the nickel and the cobalt baths which we previously investigated. The bath used in this work had the following composition: $\text{NiSO}_4 \cdot 6\text{H}_2\text{O}$, 240 g./L; $\text{NiCl}_2 \cdot 6\text{H}_2\text{O}$, 21 g./L; $\text{CoSO}_4 \cdot 7\text{H}_2\text{O}$, 12 g./L; and boric acid,

30 g./L. Since this Fink and Lah bath is similar to the Watts type nickel bath⁹ and to the Kalmus cobalt bath¹⁰ used in preceding work, and since it gave more satisfactory results with added tungstate, it was used in most of the experimental work.

For the addition of tungstate to the plating baths a solution of sodium tungstate (71.7 g./L $\text{Na}_2\text{WO}_4 \cdot 2\text{H}_2\text{O}$), containing 2 g.W/50 ml. was used. This solution was added to the bath carefully with stirring because the precipitate which formed redissolved quite slowly. It was found desirable to add calculated amounts of sulfuric acid to the plating bath before the addition of the sodium tungstate in order to keep the pH down. After the addition of the tungstate solution, the bath was filtered to eliminate a slight precipitate. The nickel-cobalt-tungsten baths thus prepared were very stable in the pH range 1.5 to 5.3 and no signs of precipitation were noted on standing at room temperature or as a result of electrolysis at elevated temperatures.

ELECTRODES. The anode material used in this work was the nickel cobalt alloy (18% Co) suggested by Weisberg.⁷ The anodes, approximately 3 mm. thick and 20 cm.² in area, were cut from an oblong-shaped commercial anode. Two such anodes, spaced about 8 cm. apart, were supported in each plating cell by nickel wire. They were cleaned after each electrolysis run by dipping in 6N HCl and scrubbing with a brush.

The cathodes, 4 cm. x 4 cm. in size, were cut from 0.002 cm. C.P. electrolytic copper foil. After buffing they were cleaned by a short cathodic treatment in a hot alkaline cleaner followed by a dip in dilute hydrochloric acid. Before weighing they were rinsed in water and alcohol and carefully dried. A single cathode was supported in the electrolysis cell, between the two anodes, by means of a platinum wire.

Electrolysis. An 800 ml. pyrex beaker served as the electrolysis cell and 500 ml. of fresh plating bath was used for each electrolysis run. Usually two such cells were used for each plating run. The cells were placed in a thermostat to maintain the desired bath temperature. During electrolysis the baths were agitated by either air or a mechanical stirrer.

A rectifier or a d. c. generator supplied the direct current. The electric circuit contained a lamp bank, a variable resistance, a voltmeter, an ammeter, a copper coulometer and the two electrolysis cells. The electrodes for the plating cells and for the coulometer were supported in such a manner that they were all lowered into the baths together to start the electrolysis run and then removed from the baths in the same manner to end the run.

The time of electrolysis was varied with the current density employed in order to obtain plates of about the same thickness. Cathode current efficiency calculations were based on the weight of deposit in the copper coulometer and the gain in weight of the cathode in the electrolysis cells. An

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³ M. L. Holt and M. L. Nielsen, Trans. Electrochem. Soc., **82**, 193 (1942).

⁴ M. L. Holt and R. E. Black, *ibid.*, **82**, 205 (1942).

⁵ M. L. Holt, R. E. Black and P. F. Høglund, *ibid.*, **84**, 353 (1943).

⁶ Colin G. Fink and K. H. Lah, Trans. Electrochem. Soc., **58**, 373 (1930).

⁷ L. Weisberg, *ibid.*, **73**, 435 (1938); **77**, 223 (1940).

⁸ D. J. Macnaughtan and A. W. Hotherhall, Trans. Faraday Soc., **24**, 387 (1938).

⁹ W. L. Pinner, G. Soderberg and E. M. Baker, Trans. Electrochem. Soc., **50**, 539 (1941).

¹⁰ H. Kalmus, C. Harper and W. Savell, *ibid.*, **27**, 75 (1915).

electrochemical equivalent of 29.35 was used for the alloy plate since the equivalents of nickel, cobalt and tungsten are nearly the same.

The pH of each plating bath was determined at the operating temperature of the bath by a special, high-temperature, glass electrode. The pH was adjusted to and maintained at the desired value by carefully adding $3\text{NH}_2\text{SO}_4$ to the bath. An experimentally determined buffer curve for the plating bath was found helpful in estimating the approximate volume of sulfuric acid required to give the desired bath pH.

The Hull cell¹¹ used in this work has a capacity of 267 ml. This test cell uses a slanting cathode and thus allows plating at different current densities on the same cathode surface. The limiting current density of a particular bath is determined by measuring the distance of the extremities of the bright range from the high current density end of the plate and applying the curve which is supplied with the cell. A copper-foil cathode and a nickel-cobalt alloy anode, both of suitable size for the cell, were used in this part of the work.

ANALYSIS OF DEPOSITS. The analysis was somewhat involved since the deposit contained nickel, cobalt and tungsten, plated on a basis metal of copper. Tungsten was determined gravimetrically by the cinchonine method. Copper was removed from the solution by precipitation with hydrogen sulfide after suitable adjustment of the acidity of the solution. After removal of the hydrogen sulfide by boiling, the solution was made slightly basic with ammonia and the precipitated cinchonine removed by filtration. The total nickel-cobalt content of the deposit was then determined by electrodeposition on a suitable platinum electrode from a strongly ammoniacal solution. The nickel-cobalt deposit was then redissolved and the nickel determined by the dimethylglyoxime method. The percentage of cobalt was usually determined by difference but in a few cases it was determined electrolytically after elimination of the nickel.

Results

HULL CELL STUDIES. This cell was used to make a comparison of the two types of nickel-cobalt plating baths and to get preliminary information about the effect of added tungstate on these baths. The Weisberg formate bath, the Fink and Lah borate bath, and each of these baths with 2 g./L tungsten were used in the Hull cell. The results are summarized in Table I.

TABLE I

Hull Cell Results

Nickel-Cobalt and Nickel-Cobalt-Tungsten Baths

Temp. 70° C; pH 4; time 10 min.; current 2 amp.

Plating Bath	Appearance of Deposit	Plating Range, Metallic Deposits
Ni-Co (Weisberg)	Bright to 1.75 in. gray to 3.5 in.	3.5 to 10.5 amp./dm. ²
Ni-Co (Weisberg) + 2g. L W	Silvery gray to 1.5 in. dull gray to 2.5 in.	4.5 to 10.5 amp./dm. ²
Ni-Co (Fink and Lah)	Semi-bright to 3 in.	1.0 to 9.5 amp./dm. ²
Ni-Co (Fink and Lah) + 2g. L W	Bright to 3.25 in. good plate	1.0 to 8.0 amp./dm. ²

The results, as expected, show that the Weisberg formate bath gives brighter deposits than the Fink and Lah borate bath; however, the difference in the effect of the added tungstate on the two baths is quite striking. The presence of tungstate changed completely the bright plate characteristic of the Weisberg bath; whereas the regular bath gave a nice bright deposit, the bath with added tungstate gave a silvery to dull deposit. In contrast to this, the added tungstate seemed to act as a brightener for the Fink and Lah bath. As can be seen from Table I, the addition of sodium tungstate to these two nickel-cobalt baths had very little effect on the current density range for metallic deposits.

THE AMOUNT OF ADDED TUNGSTATE. On observing that added tungstate had a different effect on the two nickel-cobalt baths, it was deemed advisable to study this further with varying amounts of added tungstate.

The effect was first studied with the Weisberg formate bath. Varying amounts of tungsten, as sodium tungstate, were added to separate samples of the bath and 15-minute electrolysis runs were carried out at 5 amp./dm.² with the bath at 70° C and a pH of 3.5. It was found that the bath containing as little as 0.5 g./L of tungsten no longer gave the bright deposit characteristic of the Weisberg bath. The percentage of tungsten in the deposits was quite low, increasing somewhat with increasing amounts of tungstate in the bath to a maximum of about 5%. The complete results are given in Table II.

TABLE II

Effect of Tungstate on the Weisberg Ni-Co Bath

C.D. 5 amp. dm.²; temp. 70° C; pH 3.5; 15-minute electrolysis

W Added g./L	Cathode Deposit g.	Current Efficiency Per Cent	Appearance of the Deposit	Analysis of Deposit		
				% Ni	% Co	% W
0.0	0.4141	92.3	Bright	82.0	18.0	
0.25	0.3915	87.2	Bright	82.2	17.6	0.42
0.50	0.3742	85.4	Slightly dull	81.2	18.3	0.44
1.0	0.3602	82.2	Semi-bright	82.0	17.2	0.66
			Dull silvery			
2.0	0.3896	81.1	gray	82.0	17.2	0.65
4.0	0.3670	76.4	Light gray	80.8	18.1	0.97
8.0	0.3150	70.9	Dull; poor adherence	79.0	18.4	1.98
10.0	0.3128	71.4	Gray; poor adherence	78.3	1.09	2.61
12.0	0.3279	73.9	Gray; poor adherence	76.9	18.5	3.65
16.0	0.3270	74.6	Gray; poor adherence	78.5	16.0	5.08

The effect of varying amounts of tungsten on the Fink and Lah bath was studied in a similar manner. Electrolysis was carried out for about 25 minutes at a cathode current density of 3 amp./dm.², a bath temperature of 70° C and a pH of 4. It was found that the brightening effect of added tungstate was noticeable with 0.5 g./L W added to the bath. The percentage of tungsten in the deposits increased with increasing amounts of tungstate in the bath to a maximum of about 8%. The results are summarized in Table III.

A comparison of the results given in Table II and III indicates that the Fink and Lah bath with added tungsten is better than the Weisberg bath with added tungsten; the deposits are brighter, the cathode current efficiency is better and there is more tungsten present in the alloy deposit. Therefore it was decided to discontinue work with the

¹¹ K. O. Hull, Monthly Rev. American Electroplaters' Soc. (June, 1939); Trans. Electrochem. Soc. 86, 414 (1944).

TABLE III

*Effect of Tungstate on the Fink and Lah Ni-Co Bath*C. D. 3 amp./dm.²; temp. 70° C; pH 4; 25-minute electrolysis

W Added g./L	Cathode Deposit g.	Current Efficiency Per Cent	Appearance of the Deposit	Analysis of Deposit		
				% Ni	% Co	% W
0.0	0.4605	100.	Spotted; metallic	80.0	20.0	—
0.25	0.4445	97.3	Spotted; metallic	77.0	21.0	1.9
0.50	0.3863	93.2	Gray; streaks	86.2	11.6	2.2
1.0	0.3726	89.9	Bright; streaks	85.3	13.0	2.8
2.0	0.4011	90.0	Bright	74.5	19.0	4.6
4.0	0.3982	89.5	Bright	73.8	20.3	5.4
8.0	0.4090	91.3	Bright; poor adherence	73.9	18.0	7.0
12.0	0.4300	93.2	Bright; poor adherence	—	—	—
16.0	0.4332	93.9	Bright; poor adherence	69.7	18.3	8.3

Weisberg formate bath and to use the Fink and Lah borate bath for all further studies.

In this additional experimental work a nickel-cobalt-tungsten bath of fixed composition was used exclusively. It consisted of the previously mentioned modified Fink and Lah bath to which was added 50 ml. of the regular sodium tungstate solution to give a bath containing 2 g./L W. This bath will hereafter be called the Ni-Co-W bath.

Current Density, Bath pH and Alloy Composition. Since the Hull cell studies with the Ni-Co-W bath (Table I) had shown that the bath had a bright plating range of from 1.0 to 8.0 amp./dm.², plating tests were made using current densities of 1.0, 3.0, and 6.0 amp./dm.². The bath is stable up to pH 5.3 so several bath pH values from 2 to 5 were investigated. The bath temperature was maintained at 70° C and time of electrolysis varied from 12 to 75 minutes depending on the current density employed. It can be seen from the results given in Table IV that the percentage of tungsten in the deposits decreased somewhat as the bath pH was lowered, and increased as the current density was decreased.

This study of the effect of current density and bath pH on alloy composition was also made on the Ni-Co-W bath at a bath temperature of 50° C instead of the previously used 70° C. The results showed that the lower bath temperature in all cases gave poorer-appearing deposits that contained slightly more tungsten.

TABLE IV

Current Density, Bath pH and Alloy Composition
Ni-Co-W bath; temp. 70° C; time 12 to 75 min.

Current Density amp./ dm. ²	Bath pH	Weight of Deposit grams	Current Efficiency %	Appearance of the Deposits	Analysis of Deposit		
					% Ni	% Co	% W
6	5	0.3956	89.6	Bright; some peeling	78.6	15.0	5.9
6	4	0.3817	86.6	Bright; some peeling	77.9	17.3	5.0
6	3	0.3827	87.4	Bright; some peeling	77.9	17.0	4.2
6	2	0.3110	71.9	Bright; adherent	77.8	18.7	2.9
3	5	0.4315	93.8	Bright; adherent	78.1	16.0	5.7
3	4	0.4011	90.2	Bright; some peeling	79.4	16.0	4.6
3	3	0.4119	88.8	Bright; some peeling	78.2	18.5	3.1
3	2	0.2220	48.3	Bright; adherent	77.0	20.7	2.7
1	5	0.4450	95.1	Very bright	75.6	17.0	7.9
1	4	0.4241	92.9	Very bright	76.9	18.0	4.7
1	3	0.4034	88.4	Bright; adherent	78.8	17.0	4.3
1	2	0.0818	17.5	Dull; streaked	80.6	15.0	4.1

Current Density, Bath pH and Current Efficiency. This effect of changing current density and bath pH on the cathode current efficiency was investigated in much the same manner as the previously described alloy composition studies. Current densities of 1, 3 and 6 amp./dm.² and bath pH values of 2, 3, 4 and 5 were used with the bath temperature maintained at 70° C. It was found that, at the 3 current densities used, increasing the bath pH increased the current efficiency. The results are summarized in Fig. 1.

Bath pH, Bath Temperature and Current Efficiency. All experimental results so far presented indicate that bath temperature has a marked effect on the characteristics of the Ni-Co-W bath. This effect of bath temperature was studied further at a current density of 3.0 amp./dm.², bath pH

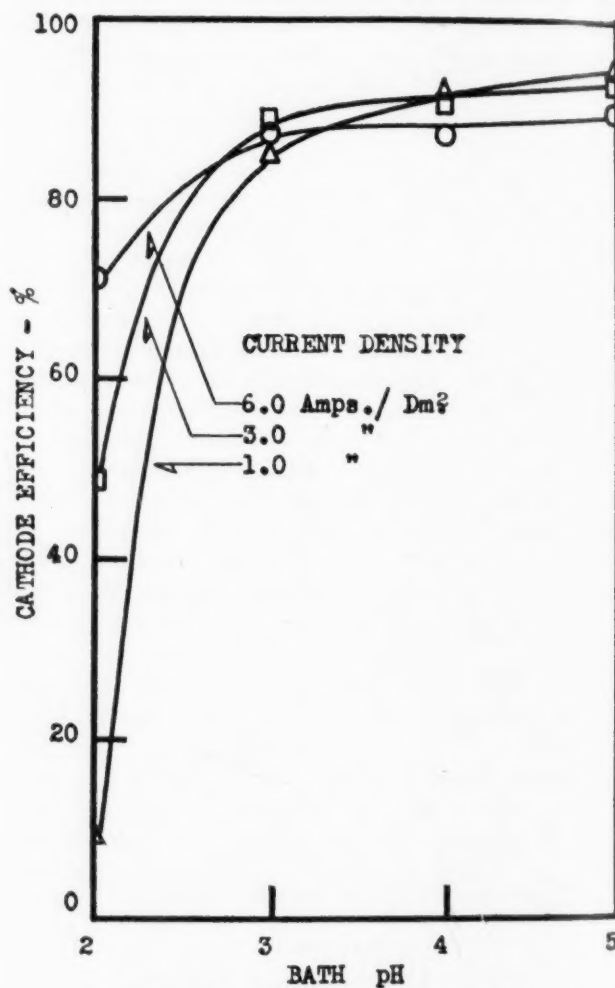


Fig. 1. Bath pH, current density and current efficiency. The effect of changing bath pH on the current efficiency of the nickel-cobalt-tungsten plating bath at several different current densities. Bath temperature 70° C.

values of 2, 3, 4 and 5 and bath temperatures of 50°, 60° and 70° C. It was found that, except at a bath pH of 2, the current efficiency increased as the bath temperature was raised. Whereas current efficiencies at 70° C were 85% and above (except at pH 2) they were around 70% at 50° C bath temperature. The results are summarized in Fig. 2.

Characteristics of the Fink and Lah Bath. In order to determine whether the effects noted (current efficiency, alloy composition, etc.) were characteristic of the Ni-Co-W bath or of the Ni-Co borate bath, it was necessary to obtain

additional information about the performance of this latter bath. Electrolysis runs were carried out with the Fink and Lah bath at a temperature of 70° C, current densities of 1, 3 and 6 amp./dm.², and bath pH values of 2, 3, 4, and 5. It was found that current efficiencies were close to 100% except at a bath pH of 2. All deposits were adherent and varied in appearance from a dark, dull gray to a light, silvery gray. Pitting was noted in most of the deposits. The results are presented in Table V.

TABLE V
Characteristics of the Fink and Lah Nickel-Cobalt Bath
Temperature 70° C

Current Density amp./dm. ²	Bath pH	Weight Deposit g.	Cathode Current Efficiency %	Analysis of Deposit	
				%Ni	%Co
6.0	5	0.4412	100.	88.2	11.0
6.0	4	0.4405	99.9	88.2	11.0
6.0	3	0.4657	98.5	87.4	12.0
6.0	2	0.3841	88.7	85.4	14.0
3.0	5	0.4594	99.8	82.8	17.0
3.0	4	0.4605	99.9	84.9	15.1
3.0	3	0.4582	98.8	82.0	18.0
3.0	2	0.3703	80.5	81.0	19.0
1.0	5	0.4569	99.9	80.2	19.0
1.0	4	0.4622	98.4	75.7	24.0
1.0	3	0.4328	93.1	76.3	23.0
1.0	2	0.2911	63.1	79.2	20.0

Corrosion Observations. It had been observed, during analysis procedure, that the various electrodeposits differed considerably in their resistance to attack by hydrochloric acid and by nitro-hydrochloric acid. To gain additional information about these differences a series of tests was carried out in hydrochloric acid. The electroplate to be tested was placed in a beaker and covered with 100 ml. of 3N HCl at room temperature. Corrosion of the plate was measured by noting the loss in weight at several intervals of time. The following general conclusions can be made as a result of a number of these semi-quantitative tests: (1) cobalt and nickel-cobalt deposits showed about the same loss in weight; (2) nickel-cobalt deposits showed a slower loss in weight than nickel-cobalt-tungsten deposits; and (3) various nickel-cobalt-tungsten deposits showed marked differences in rate of weight loss and in general those with higher tungsten content lost weight more rapidly.

Discussion and Conclusions

The experimental results show that it is possible to electrodeposit nickel-cobalt-tungsten alloys from baths prepared by adding sodium tungstate to regular nickel-cobalt plating baths. The properties of these alloys have not as yet been investigated. It may be that they will be found to have some special properties but at the present time they appear to have no characteristics that may make them better than nickel-cobalt deposits without tungsten.

The addition of sodium tungstate to nickel-cobalt baths changes the properties of the baths somewhat. The Fink and Lah bath, which normally gives a dull-appearing cathode deposit, gives a shiny deposit when a small amount of tungstate is added to the bath, and the Weisberg bath, which normally gives a bright cathode deposit, gives a dull

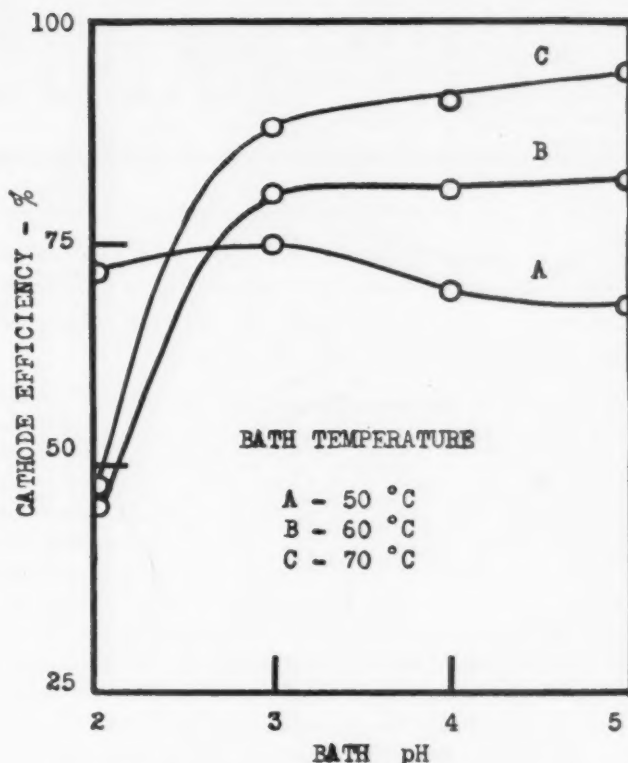


Fig. 2. Bath temperature, bath pH and current efficiency. The effect of bath temperature and pH on the current efficiency of the nickel-cobalt-tungsten plating bath. Current density 3.0 amp./dm.²

deposit when tungstate is added. Sodium tungstate thus acts as a brightener in the modified Fink and Lah bath and it has a dulling effect on the Weisberg bath. This effect, particularly the dulling effect in the Weisberg formate bath, needs more experimental work before it can be satisfactorily explained. The tungstate ion certainly disrupts the brightening process in the Weisberg bath, causing dull deposits. It is quite possible that the two brighteners are fundamentally different in their action. The tungstate ion may cause a finer type of crystal structure and the proper orientation of the surface crystals, while the organic brightener causes a typical, banded-type deposit. When the two brighteners are together in the same bath it is quite possible that the tungsten is codeposited with the organic brightener, disrupting the characteristic band structure and orientation of the surface lattice crystals, thus causing a dull deposit.

Nickel-cobalt-tungsten baths containing as much as 16 g./L W were found to be stable, but in general baths containing from 1 to 4 g. of tungsten were the most satisfactory. It is quite likely that the tungsten in these baths is tied up as a complex boro-tungstate, and no doubt the presence of a complex increases the stability of the baths.

Conditions of electrolysis had a marked effect on the performance of the nickel-cobalt-tungsten bath. In general, cathode current efficiency was best at lower current densities and higher bath temperatures. This would be expected because of greater ion mobility at the higher temperature and less tendency for hydrogen liberation at the lower current density.

The tungsten content of the deposit obtained from the nickel-cobalt-tungsten bath was affected particularly by the pH of the bath. It was found that the tungsten content of

(Concluded on page 253)

SHOP PROBLEMS

PLATING AND FINISHING
POLISHING—BUFFING
CLEANING—PICKLING
HOT DIP FINISHES

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Finishing Stainless Steel

Question: We are interested in improving our quality on stainless steel mirror finishing. Can you aid us by your recommendations as to—

1—Polishing:

- A—Grain Size of Emery
- B—Wheel Material (Felt, Leather, etc.)
- C—Wheel Speed
- D—Lubricants

2—Buffing:

- A—Buff Type
- B—Composition
- C—Speed or S. F. P. M.

Whatever recommendations you make we realize will be general but will be greatly appreciated.

C. A. C.

Answer: The grain size of emery as well as the wheel material will depend on the original condition and shape of the article. 6,000-8,000 ft. per minute is recommended as a wheel speed for polishing with the application of tallow grease stick.

For buffing, a sewed or pocket type buff is used. Aluminum oxide rouge should be used for cutting down and either chromic oxide or aluminum oxide should be applied for coloring up. The wheel speed should be 9,000-10,000 ft. per minute.

Plating Tank

Question: Can you inform me if it will be practical to use a tank of non-copper bearing aluminum alloy as a container for a chromium plating bath. If such a tank is suitable for this purpose would it be improved by anodizing?

L. S.

Answer: We do not advise the use of this metal as a material of construction for chromium baths and would suggest that you use a lead, brick or plastic lining.

Silver Plating

Question: We would like to have information on commercial silver plating specifications.

Could you please give us the equivalents in terms of thickness of plate in inches, in ounces per dozen of teaspoons and the standard, extra, triple quadruple plating. These three types of specifications are commonly given at present in different industries, and we would like to know the correlation between the three.

A. F. S.

Answer: For teaspoons, the following are used:

A-1	2 oz./gross
A-1 plus or A-1 X	2 " " "
	plus overlay
Extra	2½ oz./gross
	no overlay
AA	3 oz./gross
Double plate	4 " " "
Triple	6 " " "
Quadruple	8 " " "
Federal specifications	9 " " "

On qualities above A-1, the overlay may be included in the total weight.

You can calculate the average thickness of deposit on the basis of 2 oz./gross being equivalent to 0.00027 inches approximately.

Nickel Plating Formula

Question: I am carrying on some very interesting experiments in the plating line, and would like to get a formula for nickel plating.

W. R. R.

Answer: There are many nickel formulas depending on the results desired. These may be found in any recent issue of the *Plating and Finishing Guidebook*. The 1945 edition is available from this office at one dollar per copy, payable in advance.

Finishing Nickel Silver

Question: In our manufacturing of fishing tackle we have occasion to use a black finish on nickel silver somewhat similar to the gunmetal finish used on firearms. We have never been able to find a satisfactory black finish of any kind, either plated or oxidized that would not wear off in a short time.

We certainly would appreciate any help you may be able to give us on this, and will welcome any information on the subject, or suggestions as to processes we might try.

J. M.

Answer: Although a number of black finishes can be applied, we do not know of any which will stand wear except possibly a heat scale which may be produced by heating the parts to redness in air.

Rust Prevention

Question: You have been referred to me as a source of information for the metal finishing problem that we have. We have a number of highly polished large steel plates which are subject to rusting. Several people have informed us that it is possible to treat these plates with a coating applied with a brush that will keep the smooth surface, be easily applied, and still prevent rust. At present we have been using wax, but this treatment has proved unsatisfactory because it comes off too easily and quickly.

Do you know of any process that will fulfill the specifications I have outlined above?

C. T. G. L.

Answer: We would suggest that you communicate with manufacturers of rust preventive oils. We are attaching herewith a list of suppliers from our 1945 *Buyer's Directory*.

Gum Arabic as a Nickel Brightener

Question: My question is: Can I use gum arabic in a nickel solution at room temperature? Also can it be used in a die-cast nickel solution?

Would it have any effect in nickel coating for chrome plating die cast?

F. J. R.

Answer: This material can be used for both regular and die cast nickels but we suggest that a heavy deposit be avoided before chromium plating since the deposits from such nickel solutions are quite brittle and may tend to crack on the edges.

Gum tragacanth and cadmium may also be used as brighteners for this purpose.

Stripping Film for Sterling Silver

Question: One of our customers has recently asked us to plate a piece of sterling silver, which is designed for costume jewelry, with copper, to a thickness of approximately 1/16". He has stated that a solution of some chemical is applied over the sterling pattern before the copper is deposited so that it would leave the copper free to peel from the original pattern.

Could you tell us what kind of solution is used for this processing and

where can we purchase some?

D. J. G.

Answer: The following two solutions may be used:

1. Potassium dichromate . . . 0.3 g./liter
Borax 0.5 "
2. Iodine 1/10 oz./gal.
Potassium iodide . . . 1/10 "
Ethyl alcohol 1 fluid "

The first two materials should be dissolved in the alcohol before adding the water.

Speculum Plating

Question: Recently I have seen some articles on speculum plating, an alloy plate consisting of 45% tin and 55% copper. In all these articles they neglect to give any information on solution composition or operating conditions. I would like to have any literature you have on this subject and any other sources of information available. Your earliest answer on the above inquiry will be very much appreciated.

P. J. P.

Answer: We would suggest that you

communicate with the Tin Research Institute, c/o Battelle Memorial Institute, 505 King Avenue, Columbus 1, Ohio as they will be in a position to advise you as to the present status of the process.

Production of copper-tin deposits from cyanide solutions is covered in patents received by Batten (U. S. Pat. 1,970,543-9) and assigned to City Auto Stamping Co.

Finishes similar to speculum but containing zinc in addition to the copper and tin are obtainable and we would advise that you communicate with Special Chemicals Corp., 30 Irving Place, N. Y. C., who market a product called Spekwhite and the Hanson-Van Winkle-Munning Co., Matawan, N. J., who sell a process called Bright Alloy. The deposits from these two solutions will be of approximately the following composition:

Copper	56 to 60%
Zinc	14 to 18%
Tin	25 to 28%

The deposits are fairly bright, hard and corrosion resistant.

BUFFING SMALL PARTS

(Continued from page 247)

out as much as the washer is thick. With the washer hanging on this nail it can be pressed bodily into the wheel only moving it once to expose the small part covered by the nail head.

Washer-shaped pieces without holes—discs—requiring polished faces, can be held as follows: Press one of them into a lead block to form a depression into which all of them can be placed—one at a time—while they, and the block, are pressed into the wheel. The edges of these pieces can be buffed while the work is held between two flat files. The tangs of these files are driven into a wood handle, with the inner faces of the files as far apart as the thickness of the work. When one of the pieces is placed between the files, near the wood, leaving about half of it exposed for buffing, it presents a fulcrum for a powerful leverage provided by the file ends being pressed together.

For small pieces of a peculiar shape there is an excellent way of making a holder in two pieces. In order to simplify the description it will be necessary to imagine something of a plain shape, for example, a cube. Supposing, then, the face of a small cube needs polishing and it is desired to sink it into a piece of hard wood leaving only one face exposed, for holding purposes.

Take two pieces of wood and file across the face of each a groove as wide as the cube and half as deep. Now place them with the grooves facing each other and nail them together. You now have a square hole into which the cubes can be pressed from the front and out again with a nail from the back.

With regard to all the holders mentioned, and, indeed, all

similar ones, the real secret of success lies in the determination of the user to regard them as permanent assets. If they are carelessly tossed aside when the current need for them is over much of their advantage will be lost. They should instead, be carefully stored and then, when the same or a similar job comes along, the same holder can be used again.

THE ELECTRODEPOSITION OF NICKEL-COBALT-TUNGSTEN ALLOYS FROM AN ACID PLATING BATH

(Concluded from page 251)

the deposit increased as the bath pH was increased. It has been reported that the film surrounding the cathode varies in stability with the pH of the plating bath. Lowering of the bath pH does have an apparent stabilizing effect on the cathode film and this may in part explain the decrease in the percentage of tungsten found in the deposits as the bath pH is lowered. As the stability of the film is increased, it may be that the larger tungstate ions are restricted in this passage through the film to the cathode surface and thus the smaller hydrogen ions and nickel ions are preferentially discharged.

Considerable work must yet be done before the reduction of tungstates at the cathode can be satisfactorily explained. The negatively charged tungstate ion may be tied up in a complex and attracted to the cathode. As yet no such complex has been isolated from the bath. The actual reduction process may be gain of electrons if the tungstate is present in a complex cation or reduction by hydrogen if it is present in some other form. It is hoped that these questions and others can be answered before this general study of electrodeposition of tungsten alloys is completed.

THIS IS WASHINGTON—

By George W. Grupp

METAL FINISHING's Washington Correspondent



Rain Does Not Dampen Enthusiasm of Baltimore-Washington Platers

The morning and afternoon of May 7th were beautiful. The ladies of the National Bureau of Standards' Electroplating Section were busy preparing smoked ham, baked turkey, pies and a lot of other good things for the buffet supper to be served on the Bureau's lawn to the members and guests of the Baltimore-Washington Branch of the American Electroplaters' Society. Everyone was looking forward to this gala affair before going to the lecture room in the Chemistry Building to hear five lady electroplating experts of the Bureau of Standards deliver papers on war-time applications of electroplating. About one-half hour before the members were to meet on the Bureau's lawn, nature decided to be playful by freighting over Washington black clouds heavily laden with moisture. In spite of the heavy rainfall and the necessity of serving the buffet supper in the furniture-crowded narrow hallways of the Chemistry Building, the number present was the largest to attend a monthly Branch meeting in Washington. In fact, if many more had come they would have had to sit on the floor of the lecture room to hear the young women present their papers on electroplating.

Dr. Blum Acts as Master of Ceremonies The educational meeting was opened by Librarian Nathan E. Promisel who introduced Dr. William Blum as Master of Ceremonies who, in turn, presented the National Bureau of Standards' five lady electroplating experts.

Christoph Discusses Steel Cartridge Case Protective Coatings Kathryn Christoph presented a brief history of the problems and efforts of the National Bureau of Standards to develop suitable protective coatings which would meet the anti-corrosion requirements of steel cartridge cases used in the South Pacific. In her short paper she enumerated the various organic and inorganic coatings tested on flat steel panels; and she described the corrosion tests used in developing the desired protective coatings.

Brown Describes and Demonstrates With Brenner's Magne-Gage Lee Brown described Dr. Abner Brenner's Magne-Gage. She demonstrated its use and explained the methods of measuring organic and inorganic protective coatings with this device. She also pointed out that long training is not required to operate the instrument.

Colbert Talks on Plated Steel Tableware With a display of samples Frances Colbert told how the National Bureau of Standards helped the armed forces meet their plated steel tableware problem. She pointed out the necessity for good plate

wear for the armed services because of their unusually hard wear and rough usage by the service men. She explained how the plating was given tumbling tests to determine its durability.

Riddell Explains Progress in Cobalt-Tungsten Alloy Plating In her paper on "Electrodeposition of Cobalt-Tungsten Alloys," Grace Riddell gave a short history of the Bureau's efforts to increase the life of gun barrels. In her paper she explained the characteristics and uses of tungsten and cobalt. Then she described a new cobalt-tungsten bath which gives better throwing power, increases current efficiency, and results in a smooth deposit. She pointed out that cobalt-tungsten alloy plating had high corrosion resistance and could be used to advantage in the manufacturing of gas turbines and jet propulsion engines. At the end of her paper, Dr. William Blum predicted that cobalt-tungsten plating is one of the most fertile fields in alloy plating.

Burkhead Presents Paper on Chromium Plating Polly Burkhead illustrated her short talk on "Electrodeposition and properties of Chromium" with a number of curves and tables to show the hardness, modulus and tensile strength of chromium heat treated at temperatures from 600° C. to 1200° C. She also presented a table showing the affect of different bath concentrations on chromium.

Baltimore-Washington Branch Committees Dr. Abner Brenner, president of the Baltimore-Washington Branch of the A. E. S., recently announced the following committees: Board of Managers: Thomas F. Slattery of Washington, Dr. William Blum of Washington, and Ken M. Huston of Baltimore; Auditing Committee of One: Charles W. Ostrander of Baltimore; Banquet Committee: Wendell P. Barrows of Washington, and Chester C. Bethke of Washington; Budget Committee: Albert G. Taylor of Baltimore, and L. G. Tubbs of Washington; Exhibit Committee: Maurice Caplan of Baltimore, and Amos E. Judd of Baltimore; Historian: Raymond Stricklen, Jr., of Baltimore; Membership Committee of One: Robert D. Guerke, Jr., of Baltimore; Nominating Committee: R. M. Thomas of Baltimore, A. G. Taylor of Baltimore, and Dr. Vernon A. Lamb of Washington; Research Committee: C. H. Sample, Frank L. Davey, and Robert G. Clark all of Baltimore.

Back Numbers of the Monthly Review Being Sought In the Baltimore-Washington Branch's efforts to supply the Supreme Society with back numbers of the *Monthly Review* and *The Proceedings* and to complete the file for the Enoch Pratt Free Library of Baltimore, Fred Pierdon has donated his 1921-1945 volumes; Matthew Kraft has donated 83 back numbers, and

Dr. William Blum has given 164 issues. Other members are expected to come forward with back numbers. The Library of Congress and the library of the National Bureau of Standards are two of the three libraries in the United States which have copies of all numbers of the *Monthly Review* and *The Proceedings* of the *American Electroplaters' Society*.

Electroplating on Plastics Shown at Washington Naval Gun Factory

In celebration of V-E Day the Naval Gun Factory of Washington opened its gates to the public to see some of the things which were done during the war. Among the exhibits was a display showing the process of electroplating on plastics. There were also exhibits of dip protective developments such as cellulose acetate butyrate and ethyl cellulose. Another display showed how the Navy was fighting tropical deterioration due to fungi.

When Are We Going to Use the Laws We Already Have?

As the people of the United States are being troubled with a strike plague, Donald R. Richberg points out that Section 19 of the criminal code provides that "If two or more persons conspire to injure, oppress, threaten or intimidate any citizen in the free exercise or enjoyment of any right or privilege secured to him by the Constitution or laws of the United States . . . they shall be fined not more than \$5,000 and imprisoned not more than 10 years." Here is a section of the law strike agitators have overlooked; and what is more it covers Article V of the Constitution which provides that "No person shall be . . . deprived of life, liberty or property, without due process of law."

Five Point Industrial Peace Program

At the annual meeting of the Chamber of Commerce of the United States, Herman W. Steinkraus, president and general manager of the Bridgeport Brass Company, presented a five point program for the promotion of industrial peace in the United States. These points are: (1) the full acceptance by all parties of genuine collective bargaining; (2) workable and sound grievance procedure methods; (3) complete and up-to-date honest facts on labor, management and the community; (4) equality of labor and management before the law, and (5) a more realistic conception of the right to strike.

"Business Democracy" Means Fair Competition, Not Controls

Attorney-General Tom C. Clark, in an address to members of the Chamber of Commerce of the United States said among other things: "Our goal is 'Business Democracy' in which the doors of opportunity are open to all to enter any business and to sell at prices regulated by competition rather than by public or private groups. I don't need to remind you that in a healthy capitalistic society, competition regulates business activity with a minimum of help from government people in Washington. Honest competition brings healthy, self-regulated business."

Tax Consultant Payments May Now Be Deducted from Income Taxes

The United States Tax Court ruled on May 12, 1946, that all payments to tax accountants, acting as consultants, may be deducted from income taxes.

Congress Plans to Limit Wage Act Suits

Congress aims to establish a statute of limitation under which employees may bring suits under the Minimum Wage Law. Identical bills (HR 2788 and S. 1013), have been introduced in both houses of Congress which provide that no private suits may be filed under the Federal Minimum Wage Act after a period of one year from the time of the alleged violation. It is held that the present provisions of the Minimum Wage Act which permit the filing of suits against employers under State statutes of limitations are unsatisfactory. Efforts are also afoot to include a provision in the Act which would permit a court to reduce double damage if the employer

can show that he did not wilfully violate the law and acted in good faith. The present law makes it mandatory to punish an employer who violates the law inadvertently.

OPA to Vigorously Enforce All Regulations

George Moncharsh, OPA deputy administrator for the enforcement of price regulations, recently told the Senate Banking and Currency Committee that more attention is being given to criminal and suspension actions than to civil suits because more persons are violating the price ceilings since the end of the war. In fact he indicated that OPA intends to vigorously enforce all price regulations.

Government Questionnaires Are Still a Burden to Businessmen

The number of daily, weekly, monthly or annual report questionnaires which the various agencies and departments of the Federal Government send out to businessmen is still a burden. On December 31, 1944, there was a total of 6,048 authorized questionnaires as compared with 5,045 authorized report questionnaires as of December 31, 1945. The executive departments increased their number from 2,466 to 2,500; the independent agencies decreased their number from 1,212 to 1,207; and the war emergency agencies decreased their number from 2,370 to 1,338.

OPA Asks CPA to Extend Inventory Limitations

To prevent producers from withholding goods from the market for higher prices the Office of Price Administration has asked the Civilian Production Administration to strengthen and extend its inventory limitations.

Trade-Mark Bill Being Pressed for Passage

The Senate is being pressed to pass the Lanham trade-mark bill (HR 1654) which has already passed the House. But it is not expected to be a push-over because Senator Joseph C. O'Mahoney, of Wyoming, believes it favors big business. The Department of Justice, the Tariff Commission and the Patent Office are also said to be opposed to this bill.

Consumer Spending Since V-J Day

The Department of Commerce reports that consumers spent during the first quarter of 1946 at the annual rate of \$120,000,000,000. It also goes on to say that "the rise in the consumer expenditures from the second quarter of 1945 to the first quarter of this year compares with the changes after seasonal adjustment in the other major components of the national product as follows, the figures being stated in billions of current dollars at annual rates:

"Consumer expenditures for goods and services	plus 20
Business capital expenditures (private gross capital formation)	plus 12
Government expenditures for goods and services	minus 56
Change in total gross national product	minus 23"

Congress Now Takes a Look at Government Corporations

Recently, for the first time in the history of the United States, wholly-owned Government corporations submitted detailed budgets to Congress, which is required by the Byrd-Butler Act of December 6, 1945. Under this Act government-owned corporations must supply Congress with statements and statistical details on (1) sources and applications of funds; (2) income and expenses; (3) financial conditions of the corporation, and (4) administrative expenses. All of the accounts will be audited by the Comptroller-General.

Corporate Profits Drop in 1945

The Department of Commerce reports that the corporations of the United States in 1945 made profits, before taxes, totalling \$20,900,000,000—a decrease of 13 per cent when compared with 1944.

**Douglas Says
Trade Barriers
Must Be Curbed**

Recently, Lewis W. Douglas, president of the Mutual Life Insurance Company, said that distribution and production "unrestrained by government interference, unhampered by trade obstructions, unshackled by nationalistic monetary barriers, alone can solve the problems of scarcity."

**Commerce Department
Issues Pamphlet
on How to Promote
New Product**

The Department of Commerce recently issued a 26-page pamphlet called: "Check List: To Help You Introduce Your New Industrial Products—Economic Series No. 53." This pamphlet could be used to advantage by manufacturers of electroplating equipment and supplies; and some of the principles could be applied in selling electroplating services. The booklet deals with such subjects as: (1) Is Your New Product Salable? (2) How Many Users Will There Be? (3) What Are the Buying Habits of the Users? (4) How Will You Distribute the Product? (5) What About Competition? (6) What About Price Policy? (7) The Sales Program, and (8) What About Legal and Related Problems? The pamphlet may be bought for 10 cents from the United States Government Printing Office, Washington, D. C.

**Senate Wants to
Reduce the
National Debt Limit**

To curb new Treasury financing the Senate Finance Committee has agreed to reduce the national debt limit from \$300,000,000,000 to \$275,000,000,000. This reduction, if adopted by Congress, will narrow the margin to \$700,000,000 since the national debt is now \$274,300,000,000.

**War Department
Will Complete
Renegotiation Task
By November**

Substantially all remaining wartime contracts with industry, are expected to be completed by the War Department Price Adjustment Board about November, 1946.

**Stainless Steel
Corrosion Studied**

In a study of the corrosion of thin stainless-steel sheets in marine atmospheres, Willard Mutchler, of the National Bureau of Standards has found that "the amount of rust decreased, other factors being constant, as the degree of surface polish improved. Pickling prior to passivation increased the resistance to corrosion. Suitable paints at the faying surfaces were adequate in preventing corrosion on the light alloys for from 6 to 12 months of weather exposure at the marine localities."

**Slab Zinc Production
in April Lowest
This Year**

The American Zinc Institute reports that the production of slab zinc in April, 1946, amounted to 60,903 tons as compared with 71,612 tons in March, 1946, with 61,274 tons in February, 1946, and with 65,901 tons in January, 1946.

**Cadmium Shortage
Acute**

The Civilian Production Administration froze the Government stockpile of cadmium at present levels on May 3, 1946, because work stoppages may result in loss of 45 per cent of production of this metal. Because of this condition the CPA has asked cadmium producers and distributors to ration all deliveries so that no one will receive more than required for immediate use. Release of cadmium from the Government stockpile will only be made for emergency maintenance and repair uses having to do with public health and safety.

**Some Electroplated
Items Exempt from
Price Control**

Amendment No. 28 to Supplementary Order No. 126, effective May 6, 1946, exempts from price control automobile license plates and any

glassware, china or pottery that has been electroplated with precious metals.

**Snyder Hopes to
Increase Lead Supply**

Reconversion Director John W. Snyder hopes to increase the nation's supply of lead by intensified efforts to salvage scrap lead, stricter allocations, and by imports.

**Stanley Believes
Nickel Sales
Are Hampered By
Tariff Walls**

At the annual meeting of the International Nickel Company of Canada, Limited, Robert C. Stanley, chairman and president of the company, told the stockholders that nickel sales will be hampered by complicated exchange restrictions and high import tariffs.

**Silver Price
Being Considered
By Congress**

The Senate Appropriations subcommittee has been considering for some time the House measure which provides for the sale of Government-owned silver to industry at 71.11 cents an ounce—the price which the Government pays the producer. Senator McCarren of Nevada predicts that the full committee will recommend the sale of such silver at 90 cents an ounce. He is also of the opinion that the Treasury will buy silver at 90 cents an ounce; and he foresees that at the end of two years the price will be advanced to \$1.29 an ounce, less brassage and coinage charges, both to the producer and on the sales to industry.

**Report on Precision
Metallization of
Glass Now Available**

A report on the research efforts of the Polytechnic Institute of Brooklyn on precision metallization of glass in the production of precision resistors for pulse circuits has been published by the Office of the Publication Board of the Department of Commerce and may be had for one dollar.

**Bolivia Building
New Tin Smelter**

The Office of International Trade of the Department of Commerce reports the Bolivian Banco Minero is financing the construction of a new tin smelter at Oruro, Bolivia.

**Copper Production
Drops Sharply
in April**

The Copper Institute reveals that the production of copper dropped sharply during the month of April. The production dropped from 41,832 tons in March to 29,379 tons in April. This drop is largely due to strikes and unsettled labor conditions in this country.

**Non-Ferrous
Fact Finding Board
Recommends 18½
Cents Increase**

The non-ferrous metals industry fact finding board of the Labor Department recently recommended a general wage increase of 18.5 cents per hour for the workers of the industry. It also recommended that five cents of this hourly increase should be retroactive to September 1, 1945. The remainder of the increase is to become effective July 1, 1946, on a 40-hour week basis.

**Cadmium Sulfate
Less Soluble in
Heavy Water**

Langhorne H. Brickwedde, of the National Bureau of Standards, has made some determinations of the solubility of cadmium sulfate in heavy water and in normal water. He found that cadmium sulfate is about 8 per cent less soluble in heavy water than in normal water.

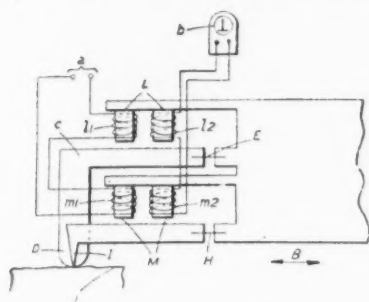
**Electroplating
Equipment Shipments
in February**

The Department of Commerce's Bureau of Census reports that during February, 1946, the shipments of industrial spraying equipment amounted to \$1,485,000 and the shipments of electroplating and anodizing equipment totaled \$588,000.

Patents

Surface Roughness Testing

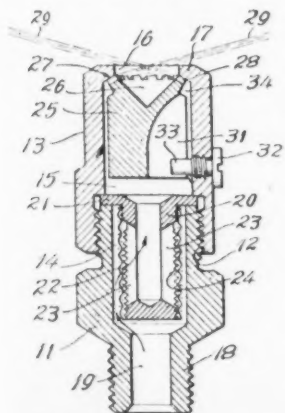
U. S. Pat. 2,396,394. H. Shaw (England), Mar. 12, 1946. An apparatus for the measurement of fine irregularities of a surface comprising in combination a common support adapted for movement parallel



to said surface spaced from the same, two styles, means attaching said styles independently of each other to said common support in such a manner that each of said styles is adapted to move, independently of the other of said styles, only at least substantially perpendicular to said surface, one of said styles being a pointed tracer adapted to enter said fine irregularities of said surface, the other of said styles being a blunt ended rider adapted to slide on said surface without entering said fine irregularities of said surface but following only its general shape, said tracer being moved by said fine irregularities of said surface independently of the movement of said rider and said rider being moved by the variations of the general shape of said surface independently of the movement of said tracer when said support to which said tracer and rider are independently attached is moved at least substantially parallel to said surface with said styles in contact therewith, and indicating means functionally responsive to differential movement of said styles.

Spray Nozzle

U. S. Pat. 2,396,449. F. W. Wahlin, assignor to Spraying Systems Co., Mar. 12,

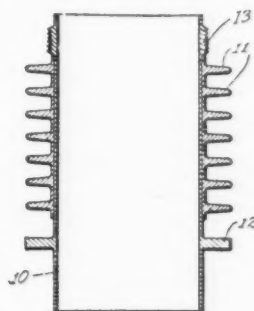


1946. A nozzle comprising a nozzle body provided with an inlet leading into the interior thereof, said nozzle body having an

outlet opening with a series of passageways circumferentially spaced along the margin thereof and leading from the interior of the nozzle body in mutually convergent and mutually non-conflicting directions that extend across the opening and over the opposite margin thereof.

Coating With Aluminum

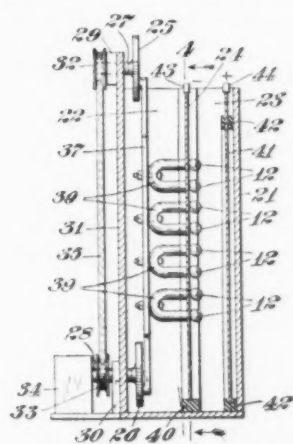
U. S. Pat. 2,396,730. M. G. Whitfield and V. Sheshunoff, assignors to Al-Fin Corp., Mar. 19, 1946. A method of coating a ferrous metal article with aluminum or aluminum alloys, which comprises forming an initial molten surface coating of a metal of the class consisting of aluminum and aluminum-base alloys on the ferrous metal article by immersing said article in a bath of the molten metal and maintaining said article in contact with said bath for a period of time at the bath temperature



only sufficient to form a ferro-aluminum film at the interface of said bath and said article and heat said article to above the melting point of the coating metal, and then casting a molten metal of the class consisting of aluminum and aluminum-base alloys on said initial coating while said coating and article are at a sufficiently high temperature for said coating to be molten and to be wetted by said casting metal to form a permanent bond therewith.

Plating Ball Bearings

U. S. Pat. 2,397,177. R. M. Wick, Mar. 26,

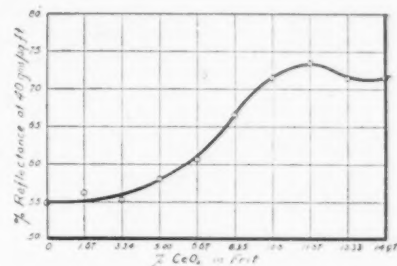


1946. An apparatus for electroplating magnetizable spheroids comprising an electroplating tank, an electrolyte contained in said tank, an anode within said tank, a non-magnetic conducting plate forming a portion of the liquid retaining wall of said tank opposed to said anode and adapted to serve

as a cathode contacting surface, a plurality of magnets with at least one pole of each next adjacent to said plate but external of said tank for maintaining electrical and rolling contact between said plate and said spheroids within said tank, and mechanical means for causing relative movement between said plate and said magnets whereby said spheroids are rolled on said plate.

Vitreous Enamel

U. S. Pat. 2,396,856. B. W. King, Jr., assignor to The Harshaw Chem. Co., Mar. 19, 1946. An enamel composition compris-



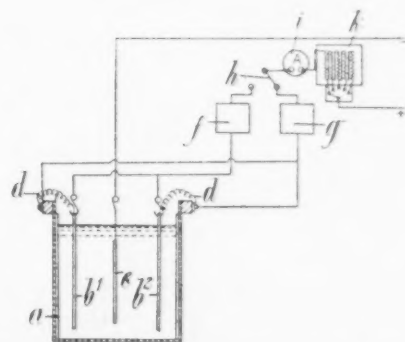
ing a frit and an oxy-compound of an element of the class consisting of antimony and arsenic, said frit containing alkali metal oxide, silica and cerium oxide, the cerium oxide constituting from 7% to 18% of the frit by weight, and said oxy-compound being present in the composition as a mill addition in proportion to yield on analysis for each 100 parts by weight of frit $\frac{1}{2}$ to 7 parts by weight of the trioxide of said element.

Purifying Zinc Solutions

U. S. Pat. 2,396,569. D. L. Griffith and L. G. Hendrickson, assignors to Hudson Bay Mining & Smelting Co., Ltd. (Canada), Mar. 12, 1946. In the purification of zinc electrolytes by means of metallic precipitants; the step of contacting the electrolyte with zinc dust coated with copper and tin as the precipitant.

Tin Alloy Plating Bath

U. S. Pat. 2,397,522. S. W. Baier (England), assignor, by mesne assignments, to The City Auto Stamping Co., Apr. 2, 1946. A method of applying a tin alloy to an article which comprises, preparing an alkaline tin alloy plating bath containing a tin compound consisting of a stannate, arranging the



article to be coated as a cathode within said bath, introducing a polarized tin anode having a surface film composed essentially, of tin

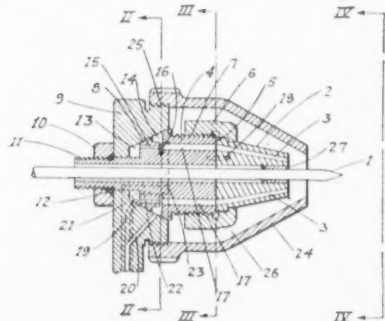
oxide in said bath to replenish the tin in the bath, maintaining a current flow at predetermined voltage from said tin anode during the entire time it is in said bath, removing the tin anode from the bath and introducing a second anode of another metal into the bath, passing a current at substantially said predetermined voltage from said second anode, and adjusting the time period during which the tin anode and said second anode are arranged within the bath so as to replenish the metals in any desired ratio.

Copper Recovery

U. S. Pat. 2,397,575. H. L. Tiger and P. C. Goetz, assignors to The Permutit Co., Apr. 2, 1946. A cyclic process of recovering copper from dilute solutions of salts thereof comprising passing such a solution through a bed of a carbonaceous water insoluble cation exchanging material, regenerating said material with a sufficient excess of relatively concentrated hydrochloric acid to recover the copper therefrom, and distilling the regenerating effluent to recover the free hydrochloric acid therein for subsequent regeneration.

Metal Spray Gun

U. S. Pat. 2,397,165. A. P. Shepard, assignor to Metallizing Engineering Co., Inc., Mar. 26, 1946. In a gun construction for gas blast spraying heat-fusible material having a combustible gas nozzle with at least one combustible gas jet discharge end, means for continuously feeding heat-fusible material to a point in gas flow directional alignment with said discharge end, and means for directing an atomizing blast gas toward said point, the improvement in combustible-gas nozzle for such gun which comprises a gas nozzle rear portion, including a substantially annular first manifold, substantially concentrically arranged with respect to the axis of the gas nozzle and substantially defined by a groove in at least one of two mating conical surfaces of said nozzle, a multiple number of first gas jets substantially evenly spaced around said axis and each ending with its outlet in said manifold, a substantially annular second

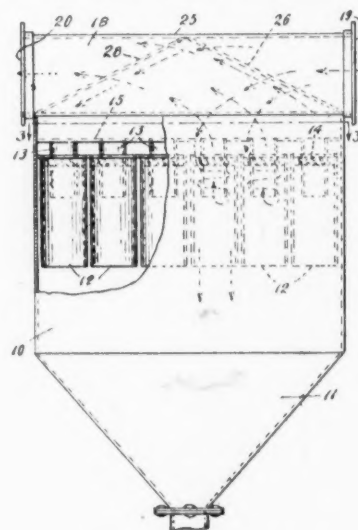


manifold for supplying one of a fuel gas and combustion supporting gas at relatively high pressure to each of said first gas jets, a multiple number of second gas jets, one for each of said first gas jets, each of internally streamlined surface dimensioned and shaped for substantially free, non-turbulent gas flow, each leading from said first manifold with its inlet in open communication therewith and each positioned with its inlet in gas flow directional alignment with the

outlet of its first gas jet, the outlet of each first gas jet being smaller than the inlet of its second gas jet, said first manifold extending across the inlet of each second gas jet to permit gas to flow from said manifold into and from all sides of said inlets, means for freely supplying the other of such fuel gas and combustion supporting gas at relatively low pressure to said first manifold and a gas nozzle tip portion, removably mounted on said gas nozzle rear portion, including a multiple number of third gas jets, one for each of said second gas jets and in approximate alignment therewith, and a groove on at least one of the mating surfaces of said gas nozzle rear and tip portion substantially connecting all of said second gas jet outlets and said third gas jet inlets.

Dust Collector

U. S. Pat. 2,397,022. R. L. Lincoln, as-

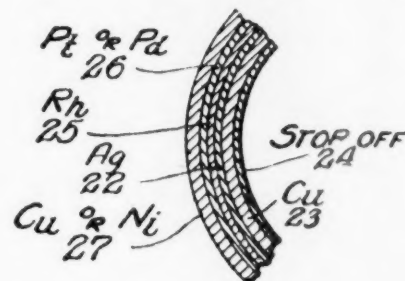


signor to B. F. Sturtevant Co., Mar. 19, 1946. In a dust collector having a plurality of substantially vertical cyclone tubes having aligned upper ends enclosed in a substantially horizontal apertured wall, having a plurality of smaller gas outlet tubes having aligned upper ends extending from and above said cyclone tubes, having spin vanes between said cyclone and outlet tubes, and having a substantially horizontal gas duct above said tubes, said duct having an inlet at one end and an outlet at the other end, the combination of a pair of spaced, substantially horizontal, apertured walls enclosing said upper ends of said outlet tubes, and extending from one end of said collector to the opposite end thereof, partitions extending upwardly from the sides of the walls of said pair to the lower portion of said duct, similar triangular partitions extending upwardly from said partitions, and contacting the upper wall of said duct between said inlet and outlet with their apices, said triangular partitions having sides sloping from said apices to the lower portions of said inlet and outlet, and other partitions extending from said upper wall at the points of contact of said apices to said lower portions of said inlet and outlet and extending between said triangular partitions and contacting said sloping sides thereof, said partitions and said pair of walls forming substantially

constant volume, gas inlet passages from said inlet into said vanes and forming substantially constant volume, gas outlet passages from said outlet tubes to said outlet.

Electroformed Reflector

U. S. Pat. 2,397,583. E. M. Wise and R. F. Vines, assignors to The International Nickel Co., Inc., Apr. 2, 1946. As a new article of manufacture, a multilayer metal composite reflector comprising a transitory



layer of copper-silver laminae in interfacial contact, said transitory layer having a concave copper outer surface and a convex silver inner surface, an electrodeposited rhodium layer on said convex silver surface, an electrodeposited layer of a platinum metal-other-than-rhodium considerably thicker than said rhodium layer on the convex surface thereof, and a supporting electrodeposited layer of non-noble metal on the convex surface of said platinum metal-other-than-rhodium layer, the said transitory layer being adapted for separation from the remaining layers whereby the rhodium layer is exposed as an optically correct reflectory surface.

Metallic Coating

U. S. Pat. 2,397,744. F. Kertesz, assignor to E. I. duPont de Nemours & Co., Apr. 2, 1946. As a new article of manufacture, a base, a coating on said base, said coating comprising a butyl methacrylate polymer containing at least 75% butyl methacrylate and having a molecular weight of at least 5,000 and containing dispersed therein finely divided metallic silver in an amount between 4 and 10 times the weight of the polymer, and a metal object soldered to said coating.

Cleaning Process

U. S. Pat. 2,399,205. C. A. Campbell, assignor of 35% to B. E. Campbell, 5% to R. B. Fossee, 5% to J. M. Ballew, and 5% to C. A. Campbell, Jr., Apr. 30, 1946. The process of cleaning metal parts for the purpose of removing buffing or drawing compounds and the like in preparation for surface treatment, comprising the steps of immersing the parts into a cleaning bath having a grease solvent layer and an underlying body of grease solvent emulsion until the parts are located entirely within the underlying body of emulsion, removing the parts from said bath and while they are still wet with the bath subjecting said parts to a spray of a mechanically combined unstable mixture of a grease solvent emulsion and an unemulsified grease solvent.

AE

CLEANER

**FOR YOUR
ALUMINUM
CLEANING WORK**

A low pH cleaner, equipped with synthetic emulsifying and wetting agents. Designed and used for both still tank and electrocleaning of aluminum.

Cowles

**TECHNICAL
SERVICE
ON REQUEST**

AE cleaner is safe, efficient and economical. It does not attack the metal when used at high concentrations and high temperatures.

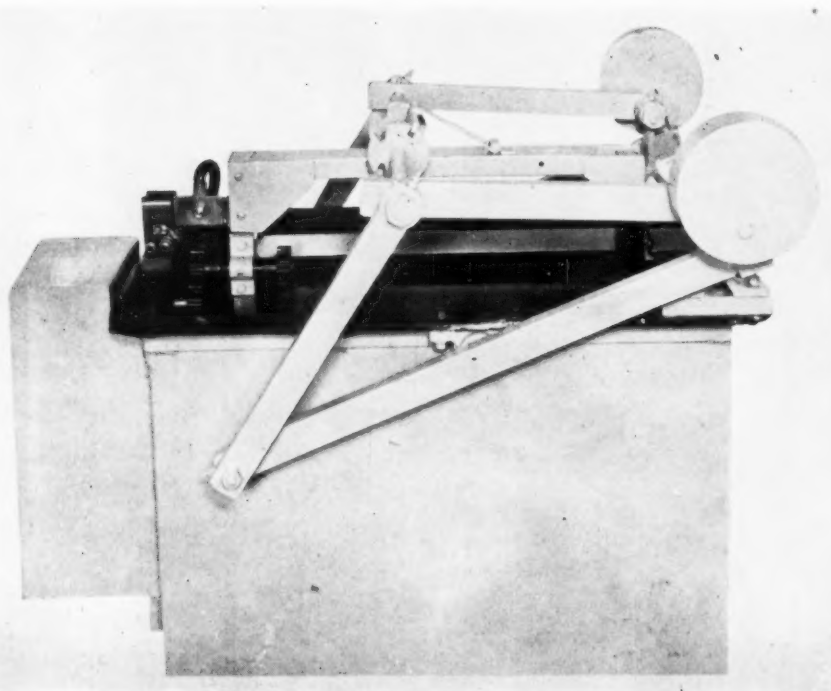
THE COWLES DETERGENT CO.

METAL CLEANER DEPT.

7016 EUCLID AVENUE • CLEVELAND 3, OHIO

NEW EQUIPMENT AND SUPPLIES

NEW PROCESSES, MATERIALS AND EQUIPMENT FOR THE METAL INDUSTRY



Barrel Plater

Lasalco, Inc., Dept. MF, St. Louis, Mo., has introduced a new intermediate barrel plater to fill the need for a plater between the capacities of the small utility and regular size Richards barrel plater.

Several features are incorporated in the intermediate plater which make it an unusual time and effort saver. Loading and unloading is made quick and easy by a counterbalancing arrangement which automatically places the cylinder in correct position and is held there by a handle and ratchet device. Loading trays are unnecessary.

Work Holding Spinner

Far greater speed and much more uniform results in polishing round, cylindrical and flat circular pieces is made possible by Presto Work Holding Spinners, announced by The Manderscheid Co., Dept. MF, 810 Fulton St., Chicago 7, Ill.

A removable fixture flange with machined surface provides for easy mounting of wood blocks or other fixtures to hold parts of various shapes and sizes. Extra flanges at nominal cost permit keeping any number of fixtures mounted on flanges ready for instant use.

For fixtures to hold smaller parts a flat headed screw is provided in the spinner shaft.

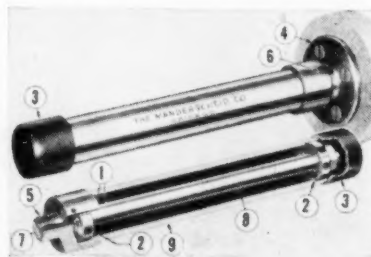
Structural features are as follows:

1. One-piece shaft and brake assembly closes the housing against dust and grit.

Other advantages are a switch type negative contact which is made automatically when cylinder is loaded into tank and an insulated negative connection through hollow hub of cylinder which prevents interference while loading or unloading.

The intermediate barrel plater is arranged for 3 speeds, has a $\frac{1}{8}$ h.p. motor, a 10" x 18" hard rubber cylinder with 8 quart or 30-lb. capacity, and is furnished with steel tank for cyanide solutions or rubber lined tank for nickel solutions.

2. Grease packed and sealed ball bearings, mounted in precision machined seats.
3. Dustproof rubber closure.
4. Removable fixture flange has machined face and screw holes—Part No. 221-B.



5. Threaded shaft for fixture flange.
6. Spanner wrench hole for easy removal of fixture flange.

7. Screw for holding small fixtures.
 8. One-half inch shaft.
 9. One and one-quarter inch diameter housing affords man size grip.
- Made in two sizes; No. 221 is 10 $\frac{1}{2}$ " over all and No. 221-A is 7 $\frac{1}{2}$ " over all.

Fan-Cooled Motor

General Electric Co., Dept. MF, Schenectady, N. Y., has announced that a new totally enclosed, fan-cooled motor especially designed for use in extremely dusty, dirty, and

PROFESSIONAL DIRECTORY

JOSEPH B. KUSHNER, Ch.E.

Metal Finishing Consultant

Problems in Automatic Plating, Electroforming and Plastic Plating; Plating Plants Installed.

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Consulting Chemical Engineers

SALT SPRAY TESTING — CERTIFIED TO MEET ARMY AND NAVY SPECIFICATIONS. Testing of deposits—thickness, composition, porosity. Solution analyses, plant design, process development.

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Complete services, including solution analyses, process development and deposit tests. S. C. TaorminaTech. Director
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ELECTROCHEMICAL TECHNOLOGY

E. J. HINTERLEITNER
and Associated Engineers

821 NORTH AVENUE, WEST,
WESTFIELD, NEW JERSEY

Phone: Westfield 2-4766

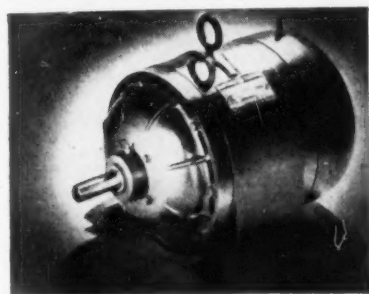
NATIONWIDE—COMPLETE CONSULTING SERVICE
for the
METAL FINISHING INDUSTRY

MODERNIZATION OF EXISTING
PLATING DEPARTMENTS

DESIGN AND ESTABLISHMENT
of
NEW AND MODERN
PLATING DEPARTMENTS AND
BUSINESSES

corrosive atmospheres has been added to the line of General Electric Tri-Clad induction motors. The new motor is available in standard, explosion-proof, and dust-explosion-proof types from 1 to 1,000 hp and can be used where iron dust and metal filings are in the air and in Class I Groups C and D and Class II Groups E, F, and G hazardous locations. Short in length and compact in construction, the motor can be installed in a small space, making it suitable for machine tool applications where the motor must be part of the driven machine.

The new Tri-Clad features a double-shell, cast-iron frame, and cast-iron end shields and conduit box for protection from external blows, dripping water, dusts, vapors, and corrosive liquids. Sealed end shields and



inside joints, and a one-piece, double-shell stator protect windings, punchings and rotating parts from moisture or corrosive elements. Long, close-running shaft fits, supplemented by a rotating seal, keep dirt from entering the motor along the shaft. Punchings and windings within the inner shell of the motor are cooled by a non-sparking external fan which is protected by a cast-iron housing with a screened air-intake opening.

The cast-iron bearing housings are cast integral with the end shields as a barrier to the entrance of foreign materials. An inner cast-iron bearing cap makes a complete enclosure for the bearing. As on all ball-bearing Tri-Clad motors, the pressure-relief greasing system is used. Greasing can be accomplished without disassembling or stopping the motor.

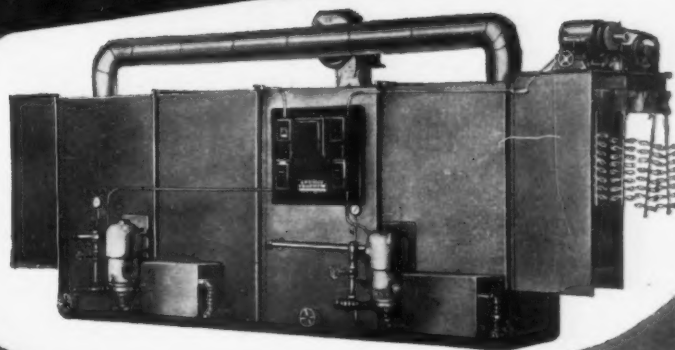
Low starting current, with balanced design, makes the new Tri-Clad suitable for full-voltage starting, thus permitting the use of simple, inexpensive control equipment. The motor has high pull-up torque for snappy acceleration, and high maximum running torque to meet temporary abnormal peaks and low-voltage conditions.

Metal Washing Machine

Optimus Equipment Co., Dept. MF, 127 Church St., Matawan, N. J., has introduced a new continuous type washing machine for handling large numbers of metal parts on racks, before plating, painting or any similar process. It will handle any type of parts provided they are free-draining, and the sprays have free access to the parts. The output of this machine is high—60 racks per hour being a common figure.

This new machine can be used as a single stage washer, or it can handle a number of successive operations, alkaline, acid or neutral. With slight alterations,

For
**continuous quantity washing
of metal parts on racks**



The OPTIMUS Rack Type Washing Machine is designed for continuous handling of large numbers of metal parts on racks before plating, painting, or any similar process. Machine output is high—60 racks per hour is a common figure.

This machine can be used as a single stage washer, or it will handle a number of successive operations, alkaline, acid or neutral. With slight alterations, a series of different problems can be handled, such as washing, rinsing, drying, pickling, cyanide treatment, etc. One of the greatest uses is for removing buffing compositions.

Any plateable part can be washed as long as it is free-draining, and sprays have free access to the parts on the racks. Machine works closed and may be connected to exhaust blower, so fumes, unpleasant odors or excessive heat are not developed. Unit can be heated by steam, gas or electricity.

OPTIMUS Washing, Rinsing, Pickling and Drying Equipment and accompanying Dependable OPTIMUS Detergents can help speed up your operations. Write for details.

**SEND FOR NEW
BULLETIN**



Write today on your business letterhead for your copy of new illustrated bulletin No. 6E1, describing OPTIMUS Equipment and Dependable OPTIMUS Detergents for modern metal parts cleaning operations.

OPTIMUS EQUIPMENT COMPANY

ENGINEERS AND MANUFACTURERS

127 CHURCH STREET, MATAWAN, N. J.

STANDARD AND SPECIAL TYPES OF EQUIPMENT FROM THE SMALLEST TO THE LARGEST SIZES FOR A WIDE VARIETY OF OPERATIONS.

OPTIMUS



EQUIPMENT

FOR WASHING • RINSING • PICKLING AND DRYING OF METAL PARTS

Be Critical...

When You Select A BLACK FINISH for STEEL PARTS

All black steel finishes are not the same. Nor will they all produce the results that you must have.

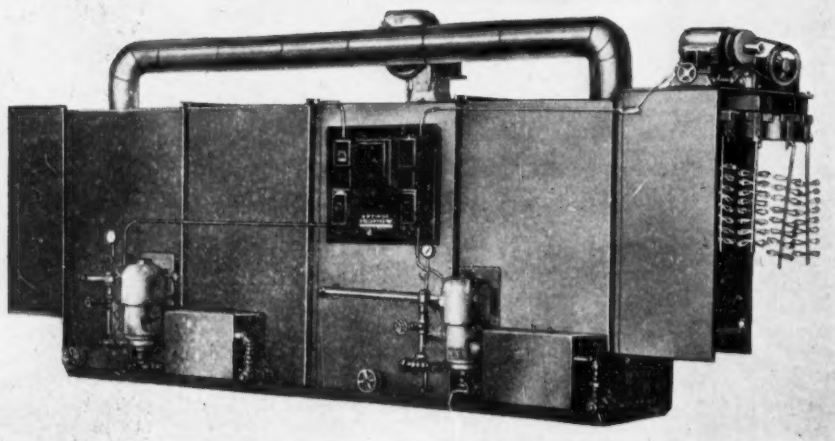
When you investigate, make certain that the process you select will blacken the parts consistently on regular production runs in your own plant. Be sure that the process is simple and easy for your men to follow. And demand a resulting finish that is uniform and attractive.

If you investigate DU-LITE first, you will never have to look further, Du-Lite has proved its worth over and over on such diverse types and kinds of steel parts and products as cameras, typewriters, novelties, engine parts, hardware, tools, guns, and wire goods.

DU-LITE
*The Dependable
Black Chemifinish
for Steel Parts*

A Du-Lite Field Engineer near you will be glad to discuss your finishing problems with you.

DU-LITE CHEMICAL CORP., Dept. A, Middletown, Conn.



this machine can take care of a series of different operations—washing, rinsing, drying, pickling, cyanide treatment, etc. If an acid solution is used, the machine is furnished built of acid-proof material. In most

cases, it is desirable to use it only as a washing and rinsing machine. Its greatest use is for the cleaning of buffing compositions after buffing and before plating.

The machine works closed and may be

connected to an exhaust blower so that fumes, unpleasant odors or excessive heat is not developed. It can be heated by steam, gas or electricity.

A number of manifolds with spraying nozzles are mounted on all sides of the washing chamber. Solution circulation system includes a pump, piping, series of filters and strainers to filter the solution before it is taken by the pump and all necessary heating devices and accessories.

The conveyor is an overhead chain type winding around two end sprockets driven by motor and speed reducer with variable speed pulley.

Machine is supplied entirely ready to use and many include electric panel, all switches and exhaust blower. Side insulation may be provided for comfort of the operators. Thermostatic control is available for any type of heating.

Fire Extinguisher

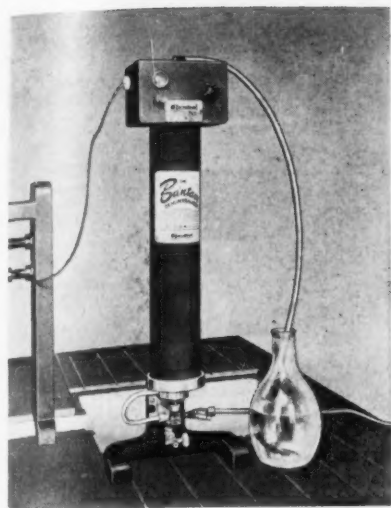
Randolph Laboratories, Dept. MF, 8 East Kinzie St., Chicago 11, Ill., has produced a new trigger-touch 15 lb. CO₂ extinguisher that is carried and operated with uninterrupted, single-sweep action. Grasping the



unit by its arched-steel handle, the employee removes the extinguisher from its bracket, carries it with only one hand. The other arm is free to remove obstacles and open doors while en route to the scene of action.

On approaching the fire, the operator grasps the nozzle handle with his free arm, aims it at the base of the flames. One touch of the thumb-trigger discharges a penetrating, snowy blanket of carbon dioxide gas . . . smothers an 8 quart gasoline fire in 9 seconds under official Underwriters' Laboratories fire tests! Release of the trigger automatically stops the flow, saves the remainder of the charge.

With no valves to twist, this simplified operation saves precious seconds—reduces the chance of "Operator's Panic." Long-range hose and nozzle keeps the fire-fighter at a safe distance from the heat of the blaze—permits easy access to overhead, side-wall or engine compartment fires. Truck and wall brackets are provided for both vehicle and factory installations.



Demineralizer

To meet the needs of laboratories and industries where the amount of de-ionized water required is not great enough to justify lengthy regeneration processes, the Barnstead Still & Sterilizer Co., Dept. MF, Lanesville Terrace, Forest Hills, N. Y., have announced their new Bantam Demineralizer. It employs a single renewable cartridge which contains both cation and anion resins which convert the dissolved salts in the water to their corresponding acids, and then chemically absorb these acids. No heat, electricity, or chemicals are employed in the process. Flow-rate is from 5 to 10 gallons per hour.

The manufacturer stresses the extreme simplicity of operation and installation. Only electrical connection necessary is for indicator light which tells when new cartridge is needed. Plugs into any ordinary outlet and load is only fraction of a watt. The Bantam can be connected to water supply by rubber tubing or 1/4" pipe. To use it is then only necessary to turn on water supply and collect demineralized water in continuous flow.

It is claimed that one cartridge will remove 400 to 600 grains of ionizable salts. Thus one cartridge will produce up to 300 gallons of demineralized water, depending upon the hardness of the raw water supply. When resistance of effluence drops to 50,000 ohms the indicator lamp goes out, showing that new cartridge is needed. To replace cartridge it is merely necessary to loosen thumb-screw which holds it in place and insert new cartridge.

Rack Coating

To solve one of the plating industry's greatest needs a new air-dry rack coating developed specifically to overcome the difficulties commonly found in applying lacquers is announced by Michigan Chrome and Chemical Co.

Known as Microtex, this new air-dry rack coating is a thermoplastic insulating material which meets the requirements of all plating, anodizing, tannerizing, parkerizing, and blanching cycles.

This coating is tough, resilient and flexible and overcomes the difficulties commonly found in lacquers which have a tendency to

CONVEYORIZED ECONOMY

DETREX CORPORATION
Detroit - Michigan

DEGREASING CASE HISTORY

Customer Accurate Spring Mfg. Co. Date Feb. 2, 1946
City and State Chicago, Illinois Division Industrial
Street 3811 W. Lake Street

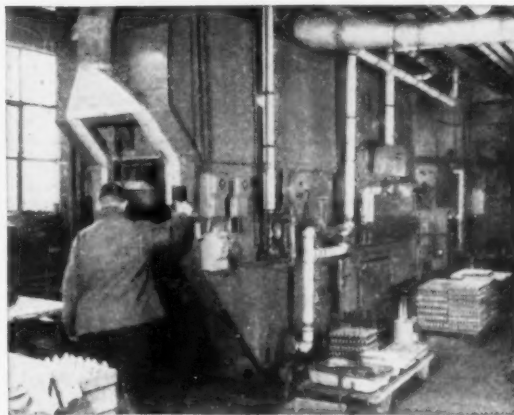
10. REMARKS: A conveyORIZED degreaser was installed at Accurate Spring Mfg. Co. in February, 1945. Their purchasing department has advised that 4 times as much work is now being cleaned than was formerly cleaned in a comparably-sized hand-operated unit. There has been no appreciable increase in solvent consumption.

with VAPOR DEGREASING

Conveyorized equipment, even on light production, cuts solvent costs and facilitates speedy metal-cleaning operations. Centralized cleaning is sometimes the answer.

Detrex field representatives are experienced in the selection of material and methods to improve your cleaning set-up. The Accurate Spring Mfg. Co. case history, taken from our files, is typical of Detrex analyses.

Small conveyorized degreasers, flexible in design and operation, require little floor space, yet suit a wide variety of applications.



All Detrex degreasers are available either zinc-spray coated or with alloy-steel clad interior surfaces. Field representatives are located in every industrial area in the United States—contact one today.



DETREX

DETROIT 27 • MICHIGAN

Corporation

E-115

Ingenious New Technical Methods

To Help You with Your
Reconversion Problems



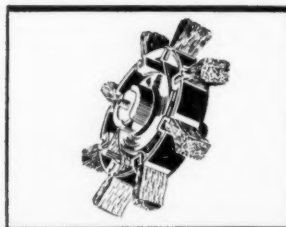
New Brush-Backed, Strip-Fed Abrasive Wheel Deburs, Sands Any Surface!

For sanding in and around the most irregular contours—for deburring parts too large to be tumbled—for removing rust, paint and imperfections from wood, plastics, rubber, earthenware and metals—the new Sand-O-Flex brush-backed abrasive wheel is MOST PRACTICAL.

The central magazine houses a strip abrasive cartridge, to be fed out as needed in front of the eight brushes which "cushion" the abrasive, and force it evenly over the most difficult surfaces. The Sand-O-Flex comes in 3 sizes, and is adaptable to any stationary or portable motor shaft, with speeds up to 1750 RPM. Abrasives are available in grits for every need.

To help speed production in dry, dusty work atmosphere, many mills and factories urge workers to chew gum to help relieve dry throat. The reason: Because dust causes throat irritation and dryness—but chewing Wrigley's Spearmint gum helps keep workers' mouths moist and fresh. The result: Reduced work interruptions and "time outs" to the drinking fountain. Even when workers' hands are busy, they can refresh as they work "on the job." And the chewing action helps keep workers alert and wide-awake.

You can get complete information from the Sand-O-Flex Corporation, 4373 Melrose Ave., Los Angeles 27, California



Abrasive Cartridge Shown Open



AA-73

become brittle with use, causing seepage under the coating and then peeling. It attains maximum adhesion without depending upon shrinkage. This lacquer is a black material with a high luster, unaffected by any solution commonly used in plating and anodizing cycles, including the electrolytic sulphuric acid strip used to dissolve bright nickel, and alkaline cleaners at boiling temperatures. The only exceptions are some of the organic solvents used in vapor degreasing. This coating is also very effective in minimizing dragout.

The new lacquer may be successfully dipped, brushed or sprayed, depending upon the construction of the rack.

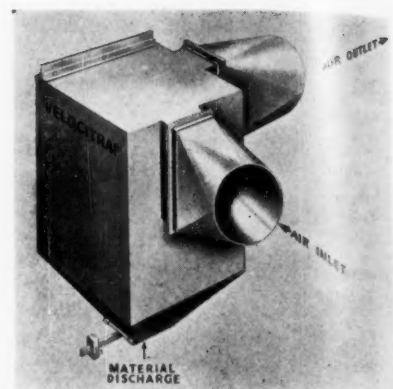
The full story of this new air-dry rack

coating is contained in a special bulletin available upon request. Write to Michigan Chrome and Chemical Co., Dept. MF, 6340 East Jefferson Ave., Detroit 7, Mich.

Auxiliary Dust-Control Unit

Where the contaminated air removed by a dust control system contains materials having a recovery value, or heavy, abrasive solids the new Schneible Velocitrap renders important service. This auxiliary unit removes heavy particles ahead of the dust collector. It salvages valuable material in a dry state for return to process, reduces abrasive wear in the dust collector, and eliminates the settling out of material in the ducts.

The Velocitrap separates solids from the



air stream by means of a slot-shaped opening in an elbow of the duct within the unit. Solid particles are expelled by centrifugal force through the slot and deposited in a hopper. A smaller shielded slot, placed opposite the intake slot, re-admits air into the duct and prevents back pressure.

This equipment is made in four types for various operating conditions and in sizes ranging from 2,000 to 20,000 cubic feet per minute capacity. Bulletin 246, supplying detailed information on the Velocitrap, will be mailed on request by the Claude B. Schneible Co., Dept. MF, 2827 Twenty-fifth St., Detroit 16, Mich.

Marking Brush

New pocket aluminum fountainbrush for all purpose marking on any surface, using hard felt pointed nibs. No larger than ordinary fountain pen for use by engineers, designers, pattern makers, inspectors, foremen, superintendents, excellent for production marking, inspection, identification, packaging and shipping.



Can be used for marking any surface such as wood, paper, glass, metal, burlap, hemp, cellophane, plastic, rubber, leather, wet or dry surfaces, hot surfaces up to 450 degrees and low temperatures to 40 degrees below zero, using a wide range of instant drying marking colors which are weatherproof, waterproof and permanent.

The fountainbrush is of light construction and equipped with an automatic control valve that feeds marking color by slight pressure. This feature eliminates sweating, leaking and flooding.

For further information write Cushman & Denison Mfg. Co., Dept. MF, 133 West 23rd Street, Industrial Department, New York 11, New York.

Atomizing Nozzle

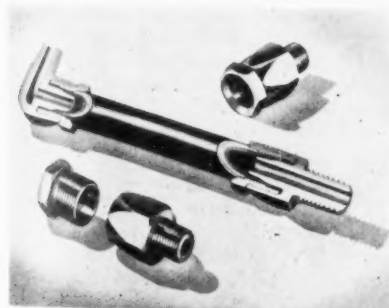
A new type hydraulic atomizing nozzle that may be mounted directly into the wall of

processing or machine equipment is now available. Applications of this type nozzle are numerous. In chemical processing involving the use of vats and mixers nozzles of this type can considerably simplify the work of setting up equipment for operation. Another important application may be found in machinery where an atomized lubricant must be sprayed on high speed gear drive assemblies.

Designed and manufactured by the Spraying Systems Co., Dept. MF, 4039 West Lake St., Chicago 24, Ill., these wall mounted atomizing nozzles are made in a variety of materials including brass and stainless steel. The nozzle consists of three parts (1) body; (2) cap with stainless steel orifice insert, and (3) body with monel metal screen or

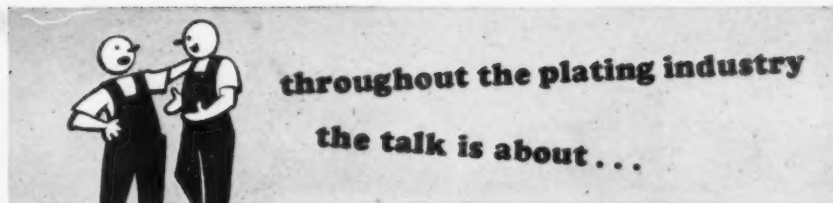


strainer. Cap and core assemblies are renewable to minimize nozzle costs in operation. Water, oil, solvents, and liquids with similar viscosities may be sprayed. Available in sixteen sizes, these nozzles provide efficient operation at pressures ranging from 10 to 1,000 lbs. per square inch. Atomization provided by hydraulic pressure will be found to be the finest possible for any given pressure. Spray is of hollow cone type, with uniform distribution of atomized liquid. Complete information on this nozzle is available by writing to the manufacturer for information data sheet No. 2830.



Hose Couplings

Announcement is made by Resistoflex Corp., Dept. MF, Belleville, N. J., of a complete line of patented attachable-detachable reusable metal couplings, which now make it possible to hand-assemble flexible hose lines. These two-piece safety-



MICCROTEX

THE NEW AIR-DRY RACK COATING

The ONLY air-dry rack coating that meets the requirements of all plating, anodizing, tannerizing, parkerizing and bonderizing cycles.

Announced only sixty days ago, MICCROTEX is already blazing a new trail in plating techniques—establishing new records for speed-up, efficiency and economy in rack coatings.

MICCROTEX is the only coating of its kind that overcomes those difficulties which have so long been common in the use of lacquers . . . MICCROTEX has high insulating qualities and dielectric strength—attains maximum adhesion without shrinkage—minimizes dragout—stands extremely hard usage—won't crack or peel—proof against all ordinary plating solutions including electrolytic sulphuric acid strip—and all alkaline cleaners at boiling temperatures.

Try MICCROTEX for speed-up, efficiency and economy in your own plant. Write for detailed bulletin.

Use MICCROMASK stop-off lacquer (Black or Red) for masking machined parts for hard chrome plating.



Developed and Manufactured by Experienced Platers

MICHIGAN CHROME and CHEMICAL COMPANY

6340 East Jefferson Avenue

Detroit 7, Michigan

seal couplings were developed by Resistoflex, whose factory-assembled compar-lined hose assemblies are original equipment in air, oil and fuel lines of cars, trucks, buses, tractors, vessels and aircraft. Combined with any flexible hose—preferably with compar-lined gas-oil hose because it is impervious to gasoline, organic solvents and oil—these reusable couplings properly attached can be trusted never to let go or vibrate loose. They are easily and quickly attached or detached and can be used over and over again, with end-wrench assembly done on the spot.

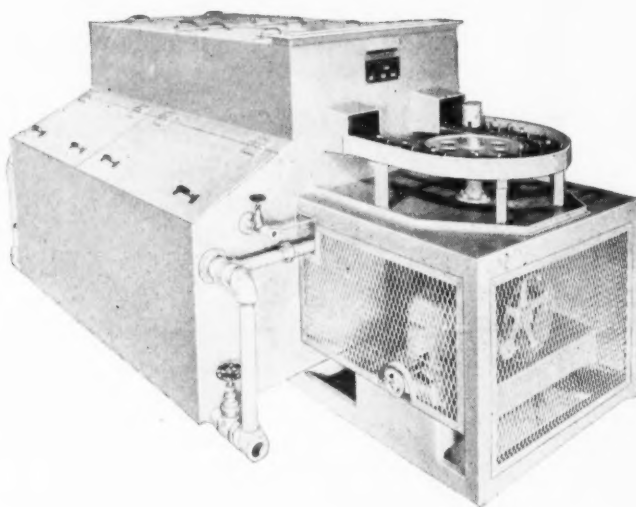
The coupling nut threads onto the hose with coupling shell compressing the hose end into a safety-seal gasket. With keep true threads, the fitting has a long even grip on the hose, the double bell shape of nut allowing hose to flex without cutting. The heavy body of the fitting prevents crushing or distorting of the line.

Stop-off Lacquer

Kotol, a new synthetic coating for use as a stop-off lacquer and protective covering for plating racks was exhibited by the United States Rubber Co. at the National Plastics Exposition held in Grand Central Palace, New York, April 22-27.

This material is highly resistant to acids and alkalis even at the elevated temperatures sometimes encountered in plating operations. It exhibits good adhesion properties and can be applied by the spray, brush, or dip methods.

The use of Kotol as a covering for plating racks was illustrated on a powered scale model of a continuous electroplating conveyor. The United States Rubber Co., Nautaguck Chemical Division, Dept. MF, 1230 Avenue of the Americas, New York 20, N. Y., will supply full information on this synthetic lacquer upon request.

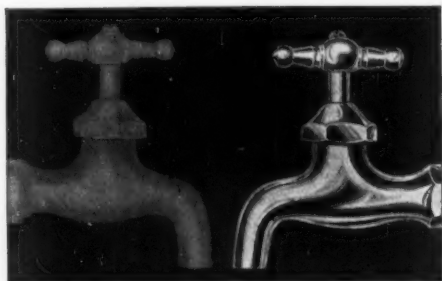


Metalwash Model HRT for Cleaning Delicate Parts

- Each piece carried individually without marring, tumbling or scratching.
- Positive removal of grinding, lapping and buffing compound.
- Any cleaning cycle, with spotless drying if required.

METALWASH MACHINERY CO.

149-155 Shaw Ave. • Irvington 11, N. J.
WASHING, PICKLING AND DRYING EQUIPMENT



New Improved LUSTREBRIGHT Bright Nickel Process

**Produces Brilliant, Lustrous Nickel Deposits.
Eliminates Color Buffing—Re-Cleaning—Re-Racking.
An Ideal Base for Chromium. Excellent Throwing Power.
No Special Solutions or Changes in Equipment Required.
Easy to Control—Low in Cost—Successful—Practical.**

Uniform results obtained on all classes of work in still tanks or mechanical barrels. Excellent for zinc die-castings. Any cold nickel solution of standard formula will with the addition of NEW IMPROVED LUSTREBRIGHT give brilliant, lustrous, adherent deposits. Guarantees

not to harm plating solution. Will not cause plate to peel, become brittle or produce streaky deposits. Illustration shows unbuffed deposits produced before and after addition of NEW IMPROVED LUSTREBRIGHT. Write for complete information.

W. C. BRATE COMPANY

14 MARKET ST.

Est. 1860

ALBANY, NEW YORK

Powerstat

In remote locations and often on heavily burdened factory power lines the voltage varies in substantial increments throughout the day. These variations are not rapid fluctuations that require automatic voltage control but slow deviations from the nominal line voltage. An ideal method of compensating for these off-nominal line voltages is by use of a Powerstat variable transformer type "LC". Known as "Line Correctors", the type "LC" consist of a Powerstat variable transformer and an auxiliary fixed-ratio transformer. The Powerstat is connected across the power lines and supplies a variable voltage to the primary side of the step-down transformer whose secondary winding is in series with one side of the line.

Generally Powerstats type "LC" are made to correct incoming line voltage variations of plus or minus 15 to 20 per cent; but special fixed-ratio transformers can be designed to suit almost any requirement.

Single and three phase combinations are available to operate from either a 115, 230, or 440 volt source. They are offered in manually and motor operated models.

Further information may be obtained by writing to Superior Electric Co., Dept. MF, Bristol, Conn.

Coated Salt Tablets

Enteric Coated Salt Tablets, designed to meet the requirements of workers who need salt but find regular salt tablets disturbing, have been announced by the Standard Safety Equipment Co. Enteric coatings are a recognized means of providing the body's saline needs without unpleasant action on the stomach. A full description of these coated salt tablets and dispensers is available from the Standard Safety Equipment Co., Dept. MF, 232 West Ontario St., Chicago, Ill.

Business Items

Basil W. Waring, formerly with the Norfolk and Western Railway Company's Chemical Laboratories in Roanoke, Va., has joined the staff at *Battelle Memorial Institute* in Columbus, Ohio.

He entered the railroad's service immediately after graduating from Virginia Polytechnic Institute with a Bachelor of Science degree in Chemical Engineering in 1937. His chief interest has been development work in protective and decorative electroplating. Under his technical cooperation the company has pioneered in electroplate on locomotive side rods, hard chrome plate on wear surfaces, and other miscellaneous projects. He is the author of a number of technical articles which have appeared in national railroad magazines and past chairman of the *Virginia Blue Ridge Section of the American Chemical Society*.

The appointment of *S. H. Bivins* as manager of *Detrex Western Regional Industrial Sales* has been announced by *W. F. Newberry*, industrial sales manager of *Detrex Corporation*, Detroit 3, Mich., manufacturers of industrial cleaning equipment and chemical cleaning compounds.

Since joining *Detrex* in 1936, Mr. Bivins

has been divisional manager in Milwaukee and St. Louis. Until his recent appointment, he has held the position of divisional manager in Ohio, working out of the Cleveland office.

Mr. Bivins, whose headquarters will be in Chicago, Ill., will bring to his new post a knowledge of a wide range of cleaning applications, having had years of experience in both the solvent degreasing and alkali phases of industrial metal cleaning.

Dr. W. A. Lalande, Jr., director of White-marsh Research Laboratories, Pennsylvania Salt Manufacturing Co., has announced the appointment of Dr. John F. Gall as assistant research supervisor to assist in the coordination of the experimental activities of the Research Division of Pennsalt's Research and Development Dept.

John W. Burley, Jr., a graduate from Pratt Institute, Brooklyn, N. Y., as a Bachelor of Mechanical Engineering, formerly a special technical advisor in Tools Branch Machine Tool Section of War Production Board, Washington, D. C., has been appointed to the technical sales force of Quaker Chemical Products Corp., Conshohocken, Pa.

Mr. Burley is a veteran of World War II and has been honorably discharged after having served in the Army of the United States as a 2nd lieutenant.

Mr. Dorian C. Wilkinson, recently released from the Navy as a Specialist (y) 3/c, has returned to the company and has resumed his former position as a process engineer in the metal field.

Since his entry into the service in March, 1945, Mr. Wilkinson interviewed discharges and answered educational problems related to the G. I. Bill of Rights.

The George L. Nankervis Co., manufacturers of metal finishing equipment, has moved its offices and engineering department from 5408 Commonwealth Ave. to larger quarters at 5442 Second St., Detroit 2, Mich. With the shift the Nankervis Co. has practically doubled its manufacturing space, allowing additions to its engineering and office staff.

Pemco Corporation has announced the completion of their fifth and newest wholly continuous smelter unit. This new addition along with the improvements which have been made on the four continuous units now in operation is expected to increase the capacity of the plant more than fifty per cent, and will mark a long step forward in the production of even better frits and glazes than were possible before the war.

It is interesting to note that the wholly continuous smelter is an exclusive development of the company, and its construction is fully protected by Pemco patents. This type of smelter, electronically controlled, removes the smallest possible chance of error and the frit that it produces is "never touched by human hands" until it reaches the customer. The extraordinary uniformity of the frit produced by this "continuous smelting" method has been influential in raising the standards of quality of finished porcelain enamel ware throughout the industry.

The company was the first in the United States to produce porcelain enamel frit com-

HOW TO BEAT THE GRIPE SHORTAGE

... and step up
your polishers'
production, too!

HERE IS one shortage that actually can give your production a lift! It's easy: Take the bull by the horns. Say goodbye to glue. Switch to new, modern GRIPMASTER—the amazing, "years-ahead" polishing wheel cement that boosts polishers' production an average of 47% more pieces per head! GRIPMASTER contains a secret new high heat resisting ingredient. It does not "glaze" on the wheel. One grade grips all grains—250 to 20. Greatly expanded manufacturing facilities guarantee immediate shipment.



IMMEDIATE SHIPMENT!

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PAT. PEND.
POLISHING WHEEL CEMENT

A few jobber territories still available.

GENEROUS
FREE
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Please send us a generous free sample of Gripmaster.

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ATTENTION _____
ADDRESS _____
CITY _____ STATE _____



Heetmaster Hot Dip Tanks are sold by Magnuson Products Corporation for cleaning operations for use with PERMAG Cleaning Compounds. Heetmaster Tanks are made in sizes to meet your requirements.

PERMAG

**Used with the Heetmaster
Hot Dip Tank reduces
Labor and Time costs**

PERMAG Compounds are unsurpassed for cleaning small parts fast and efficiently in Heetmaster Hot Dip Tanks. These tanks are equipped with removable dipping baskets to hold small parts.

A scum gutter runs the length of the tank, and sludge drain is provided for scraping or carrying off refuse.

PERMAG Compounds are used in nearly every industry for producing a chemically clean surface for finishing. Let us send you complete details of PERMAG Service.

Magnuson Products Corporation
50 Court St. BROOKLYN 2, N. Y.
In Canada: Canadian PERMAG Products Ltd., Montreal.



A MASTERPIECE OF PLATING RACK INSULATION

This new thermoplastic insulation has all those things the busy production plater demands: (1) air drying, and only a few coats to form a thick and tough insulation that really stands up in the Cleaner-Copper-Nickel-Chrome cycle. (2) Just a single material in one tank provides the smooth glossy coating that rinses freely and is chemically inert, and will not affect any plating solution. (3) Thermal stability and permanent flexibility, will not crack when moved from a hot tank to a cold rinse. (4) Actual adhesion to bar Copper as used in making racks, yet it is simple to repair and is not toxic to the men who use it. (5) Less labor cost because it is a low viscosity liquid in which racks can be dipped rapidly and the resulting insulation does not form curtains or pockets.

May we send you complete information?

NELSON J. QUINN COMPANY

TOLEDO 7, OHIO

BUNATOL

mercially and the addition of this new smelter marks another highlight in its thirty-seven years of continuous pioneering for the development of the porcelain enameling industry.

On the way toward prewar status in staffing branch offices of the *ILG Electric Ventilating Co.*, Chicago, Ill., four new appointments have been announced by *P. D. Briggs*, vice-president and general sales manager.

F. H. Bigelow has been named manager of the ILG office in Atlanta, Ga. Mr. Bigelow is a graduate of the Armour Institute of Technology (now Illinois Institute of Technology) of Chicago. He served with Commonwealth Edison Co. of Chicago for two years and with a local air conditioning contractor in Memphis, Tenn., for five years. In 1937 Mr. Bigelow became manager of the ILG branch office in Memphis where he remained until his new appointment.

Replacing Mr. Bigelow as manager of the Memphis office is *H. H. Wilson*, recently re-

leased from the Navy. Wilson received a B.S. degree from the University of Tennessee in 1940 and worked a short time with the *Bell Telephone Co.* and the *Federal Power Commission*. Called as an Ensign in the Naval Reserve in 1942, he rose to the rank of Lieutenant, Senior Grade. Wartime service was concentrated in the fields of radar and radio engineering. He is a member of the *Memphis Engineers Club*.

In the nearby city of Knoxville, Tenn., the ILG office has been re-opened under the supervision of *E. Lloyd Widner*, manufacturers representative for the last twelve years. After attending Knoxville schools and Johnson Bible College, Widner gathered experience in the heating and ventilating field with *C. M. McClung & Co.*

Further north, in Louisville, Ky., *Henry M. Lutes* has been established as manager of the company's branch office. Holding a B. S. degree from the University of Kentucky, in 1934 Lutes became associated with the *Columbus Heating and Ventilating Co.* of

Columbus, Ohio. Subsequently, he represented the *Minneapolis-Honeywell Regulator Co.*, the *Gates Rubber Co.*, and the *American Air Filter Co.*

These moves bring the total number of ILG branch offices in principal cities to forty-three.

With the purchase of the building adjacent to their present quarters at 1621 West Carroll Ave., the *Industrial Filter and Pump Mfg. Co.* of Chicago has added 22,500 square feet of floor space to its production facilities. Machinery and equipment for vulcanizing rubber to steel tanks, valves and fittings have been installed in the new building.

United Chromium, Inc., announces the appointment of *Richard J. Wooley* as its West Coast district manager. He will be in charge of Unichrome sales and service for California, Oregon, Washington and British Columbia, and will make his headquarters at 4536 District Blvd., Los Angeles 11, Calif.



Richard J. Wooley

Mr. Wooley is highly qualified by both technical background and extensive practical experience to render valuable assistance and service to the growing number of customers of Unichrome processes and materials in the Western area.

He has been connected with United Chromium, Inc., since January, 1944, first as chemist at its pilot plant and laboratories, and then as service engineer. Previously, he worked as plating engineer at the Chrysler Evansville Ordnance Plant. Mr. Wooley was graduated from Michigan State College in physical chemistry and chemical engineering, and was senior instructor in physical chemistry.

Walter R. Fidelius has been appointed assistant chief engineer by the *Optimus Equipment Co.*, Matawan, N. J., manufacturers of metal washing and drying equipment.

Mr. Fidelius was formerly with the *Fitzgibbons Boiler Co., Inc.*, of Oswego, N. Y. There for thirteen years he was maintenance engineer and during World War II was superintendent of Tank Hall Dept.

Prior to that, Mr. Fidelius was associated



Walter R. Fidelius

with the Williamsburg Power Plant Corp., Brooklyn, N. Y., as test engineer supervising tests in electric and steam power operation.

A mechanical engineering graduate of Cooper Union, Mr. Fidelius continued his studies at New York University. In his new post, he will supervise design, construction and service.

The International Nickel Co., Inc., announces the opening of the Empire State Technical Section of its Development and Research Division as of April 1. It will be located in the Genesee Valley Trust Bldg., Exchange and Broad Sts., Rochester 4, N. Y., and will furnish technical information and assistance to industry in the State of New York excluding New York City, the Albany area, and the Hudson River Valley.

Gilbert L. Cox, metallurgical and chemical engineer, will be in charge. He has been associated with International Nickel since 1931, serving in various capacities in its Development and Research Division. At one time he specialized in corrosion engineering, particularly in regard to the applications of high nickel alloys, nickel alloy steels and cast irons.

During the war years he was on active duty with the United States Army Ordnance Department. Part of the time Mr. Cox was engaged in ordnance research at Watertown Arsenal. Later in May, 1944, he became chief, Cannon Branch, Artillery Development Division, Research and Development Service, Office Chief of Ordnance in Washington. In February, 1946, he received the Legion of Merit for his "direction of many important projects for the development of new and improved cannon resulting in increased effectiveness of the weapons used by our troops."

Mr. Cox returned to International Nickel at the beginning of this year.

Mr. H. H. Bristol, president of The Bristol Co. of Canada, Ltd., announces the appointment of Mr. Charles Webber as managing director of the company. Mr. Webber will be in complete charge of the Canadian factory, which is located at 71-79 Duchess St., Toronto 2, Ontario.

In assuming these duties, Mr. Webber brings to The Bristol Company of Canada, Ltd., over 25 years of experience in instru-



... in this full-automatic plating cycle at



For pleasing brilliancy, corrosion protection and prevention of stains and fingermarks during assembly, without effect on electrical conductivity or solderability, General Electric chose Luster-on* bright dip for the speaker shells, chassis and other zinc-plated parts of its 1946 radio line.

To meet the needs of their full automatic plating equipment, our engineers developed the new Conveyor Type Luster-on* Acid — a specially buffered product to give the same fine results as regular Luster-on*, but with 6—7

times slower action so as not to require mechanical delayed action transfers.

Conveyor Type Luster-on* is even more economical than that used in hand operated cycles — another powerful advantage.

If you use zinc-plating, you need Luster-on* — available now in two types, for hand or automatic use. Write for full details today.

12

*Patent applied for

THE Chemical CORPORATION

54 Waltham Ave., Springfield 9, Mass.

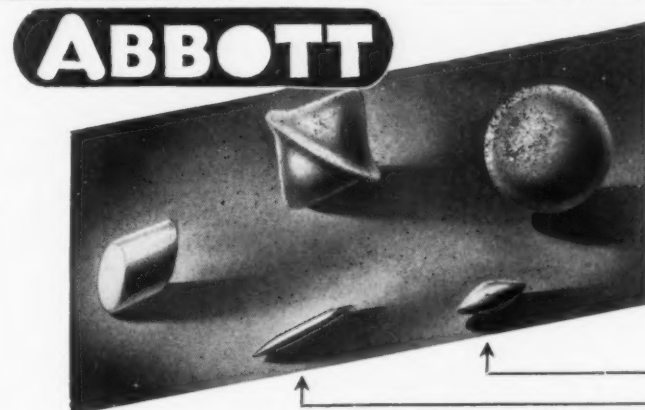
THE CHEMICAL CORPORATION
54 Waltham Ave., Springfield 9, Mass.

Please send me full particulars about Luster-on* bright dip for zinc surfaces. I am (am not) sending sample part for free dip. No obligation, of course.

Name.....

Address.....

Metal Finishing, June



Sample Kit...
All sizes and
shapes. May
we send you
one?

"Pins" do the work on costume jewelry. . . . They make contact in the normally hard-to-get-at crevices and corners When required, balls, cones, and slugs can be added to assure contact on ANY surface. . . . Use Abbott Burnishing Materials to prepare the base metal of your product for plating.

THE ABBOTT BALL COMPANY 1046 NEW BRITAIN AVE.
HARTFORD 10, CONN.

PenKote MASKING LACQUERS

For EVERY Requirement

SAVE TIME

CUT COSTS

BOOST PRODUCTION



PEN-KOTE Masking Lacquers are easy to apply by brush, dip or spray, and are exceptionally quick-drying. They adhere firmly for sharp stop-off line, yet are trimmed readily. They cannot contaminate solutions or tarnish the work—and they provide a durable, perfect coating of high dielectric strength, quickly removed after plating.

There's a proven Pen-Kote Masking Lacquer for every selective plating requirement. Note the features listed below.

No.	For	Color	Special Features
110	Hard Chrome	Green	Only 1 coat needed. Extreme density, adhesion and dielectric strength. Very economical.
120	Hard Chrome	Solid Red	Excellent adhesion. High solids content for good coverage of sharp edges and corners.
130	Hard Chrome	Transp. Red	Extreme flexibility and strength. Particularly suited for dipping and easy removal.
140	Hard Chrome	Bright Yellow	Exceptionally brilliant color. Ideal for use in hard-to-see recesses.
150	Copper & Cadmium	Reddish Brown	Ideal for production spraying. Withstands electrolytic cleaning. Quickly removed.
160	Copper Hi Temp.	Green	Only 1 coat needed. Has exceptional adhesion and resistance to high temperatures.
170	Tin and Zinc	Red	Unusually resistant to high-caustic solutions.
180	Silver	Green	Exceptional dielectric strength in all high-cyanide solutions.

Descriptive bulletin gives complete information on all of these lacquers. Write for a copy today—and for name of supplier near you.



PENINSULAR CHEMICAL PRODUCTS CO.
6795 EAST NINE MILE ROAD
VAN DYKE • MICHIGAN

ment manufacture and sales. He was formerly New York district manager of *The Bristol Company*, and prior to that, was attached to *The Bristol Company* at Waterbury, Conn. He has had extensive experience in the application of industrial instruments, particularly in the control field.

Chester Manufacturing Co., Lisbon, Ohio, manufacturers of chain hoists, trolleys, etc., which has been operated for the past five years as a partnership, incorporated as *Chester Hoist Co.*, effective April 8, 1946.

The officials are, president, *Hal F. Wright* (the founder of the business); vice-president, *Mary T. Wright*, and secretary and treasurer, *Harry E. Hill*.

W. F. Newbery, industrial sales manager of *Detrex Corporation*, Detroit 27, Mich., manufacturers of industrial cleaning equipment and chemical cleaning compounds, has announced the promotion of *R. W. Pflug* to national accounts manager.

Mr. Pflug, formerly central regional manager, started in the engineering department of *Detrex Corporation* in April of 1935. From the engineering department he was transferred to sales as service engineer on national accounts, and then was central regional manager until his recent appointment.

Mr. Pflug's latest appointment will enable him to bring to his new post a wide knowledge and considerable experience in the handling of sales accounts on a nation wide basis.

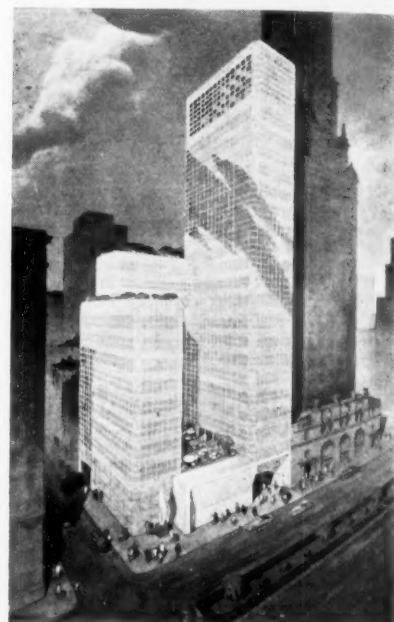
The twenty-story office building to be erected by *Aluminum Company of America* at Park Ave. and Fifty-eighth St. will be the first building in the world to employ a new type of construction embodying an aluminum-faced curtain wall, the company has disclosed. In fact, the entire facade, with the exception of the window areas, will be of aluminum.

Plans announced for the structure, designed

as a dramatic demonstration of all the proven architectural applications of aluminum, have already stirred considerable comment in architectural circles, which believe it may exert a profound influence on future construction.

Together with its architects—Harrison, Abramovitz and Wiggins, one of the firms that helped design *Rockefeller Center*—Alcoa has been actively studying this type of construction for the last several years. Actual physical work on clearing the site will begin as soon as conditions within the building industry permit, company officials said.

Although Alcoa currently plans to occupy all the space in the building for its sales offices, the company will continue to maintain its general headquarters in Pittsburgh.



The shape of this distinctive physical advertisement for aluminum has been dictated generally by the New York set-back and area laws. It will feature an open terrace at the second story level and set-backs at the tenth and thirteenth floors. Designed to have something of an irregular U-shape, the building will permit maximum utilization of office space exposed to daylight, and afford each office an excellent view.

On the street level, pedestrians and passing motorists will see a large expanse of glass which will flood with daylight a commodious display area housing a large and ever-changing exhibit of aluminum products. At the rear of the room an aluminum-faced escalator will convey guests and business callers to a long lounge providing rest facilities and a meeting place on the second floor. Here also will be located an assembly room accommodating approximately 100 persons.

All rooms, of course, will make liberal use of aluminum. Alcoa engineers have been studying the possible use of movable aluminum interior partitions to demonstrate concretely the advantages aluminum offers office planners in making their space adjust flexibly and economically to changing needs.

Garage facilities for building occupants will be located in the basement.



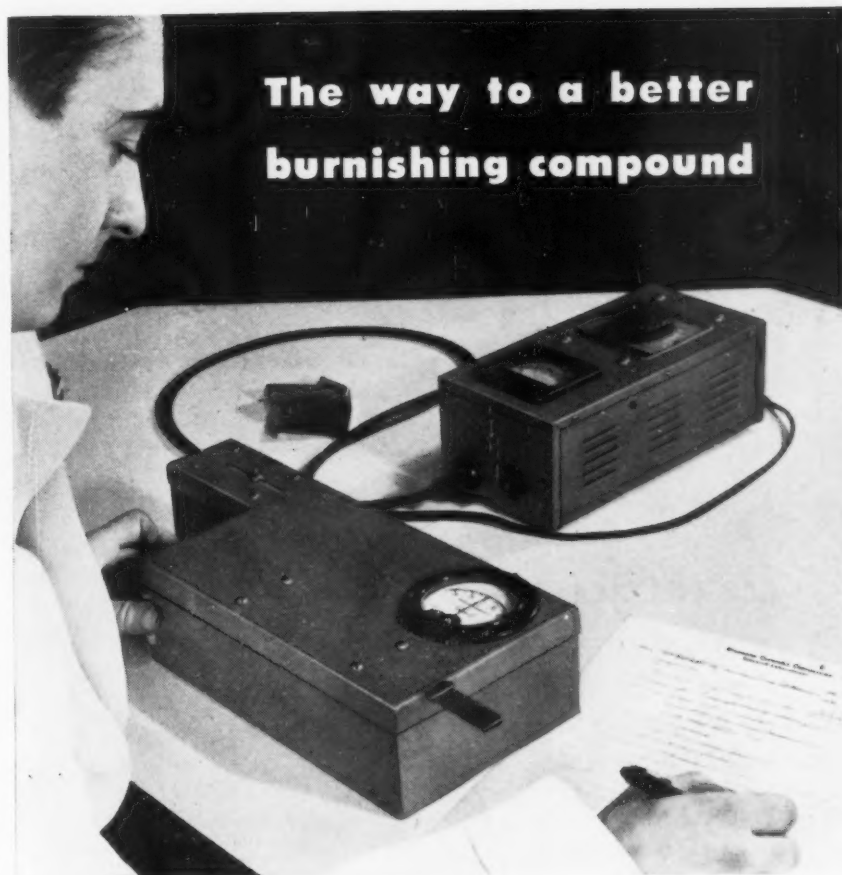
Golden Latshaw

Calgon, Inc. has announced appointment of Golden Latshaw, Cleveland, as its first sales representative for the company's new rustproofing treatment of steel and galvanized steel. Mr. Latshaw formerly lived in Pittsburgh, but has resided in Cleveland for the last five years. He will make his headquarters at Pittsburgh.

The Pemco Corporation, Baltimore, Md., has announced the appointment of Mr. J. Eugene Eagle to their sales staff. Mr. Eagle graduated in 1923 from Alfred University with a B.S. in Ceramic Engineering. In 1937 he returned to Alfred University to do thesis work on high temperature chrome colors and graduated the following year with a professional engineer's degree. Mr. Eagle had eight years' experience in the tile industry while working for the Mosaic Tile Co., Zanesville, Ohio, and the Cambridge Tile Co., Cincinnati, Ohio.

For twelve and a half years he was associated with the Vitro Manufacturing Co., of Pittsburgh, Pa., doing work on sales, development, and service of ceramic colors. For the last three years Mr. Eagle has been associated with the War Production Board, Washington, D. C., in the capacity of Chief of their Non Metal Section. He served on the Board of Trustees for the American Ceramic Society from 1941 to 1944, and for quite a number of years served in the office of the Materials and Equipment Division of A.C.S. The addition of Mr. Eagle to the Pemco Sales Staff is in keeping with their announced intention of expanding every department of the corporation to adequately care for the rapidly increasing requirements of the trade.

The Naval Ordnance Development Award has been conferred by the Chief of the Navy Bureau of Ordnance on Stoner-Mudge, Inc., of Pittsburgh, its employees, and the staff of its multiple fellowship on protective coatings at Mellon Institute, in recognition of exceptional technical service. The particular contributions to the war effort lay in the field of protective lacquers, strippable protective coatings, and moisture-proofing materials.



● By means of the reflectometer, a research man at Wyandotte Chemicals Corporation determines the relative reflectivities of brass plates burnished with various compounds and finds how improvements can be made. The result of such study was Wyandotte Burnishing Compound 315.

In Wyandotte Burnishing Compound 315 you have a new development! It contains no cyanide to cause you annoyance and hazard. Yet it removes tarnish from copper-base alloys, brass, bronze and copper more thoroughly than the old-type cyanide treatment.

Wyandotte Burnishing Compound 315 rinses freely from the work and burnishing balls — leaving no objectionable soap films to dull the work or hard water scum to necessitate frequent cleaning of equipment. Finished articles have a bright and lustrous surface.

Let your Wyandotte Representative show you how Wyandotte Burnishing Compound 315 can give you satisfaction. He's always at your service.



WYANDOTTE CHEMICALS CORPORATION • J. B. FORD DIVISION
WYANDOTTE, MICHIGAN • SERVICE REPRESENTATIVES IN 88 CITIES

CLEANED
and CONDITIONED
METAL SURFACE
Certified
FOR DURABLE
LUSTROUS FINISH

CHEMICALS
ACP
PROCESSES

ACP CHEMICALS
PROPERLY CLEAN
and PREPARE
METAL SURFACES for
ORGANIC FINISHES
Prevent paint failures
Minimize rejects
Assure enduring
lustrous finishes

MANUFACTURERS OF INHIBITORS AND METAL WORKING CHEMICALS

AMERICAN CHEMICAL PAINT CO.
AMBLER **ACP** PENNA.

EACH of the following American Chemical Paint Co. products excels in the special application for which it was developed—all prepare metal surfaces for durable finishes:

COLD SPRAY-GRANODINE produces a dense smooth zinc phosphate coating that protects steel and paint for a durable, lustrous paint finish.

THERMOIL-GRANODINE creates a heavy coating of iron and manganese phosphate which when oiled retards corrosion and prevents excessive wear on friction surfaces. When painted provides unusual protection.

DURIDINE 210 B (formerly 210 B Deoxidine) assures proper cleaning and a thin, tight and relatively hard phosphate coating so essential to a bright enduring paint finish.

DEOXIDINES — Phosphoric acid metal cleaners. Remove rust and rusts and prepare metal surfaces properly for lasting paint finish.

LITHOFORM — a phosphate coating that bonds paint to galvanized, zinc or cadmium coated surfaces.

Manufacturers' Literature

Publications listed in this department are obtainable from the manufacturer without charge.

Deodorizing and Disinfecting

Sanitation engineers, superintendents and foremen of metal working plants will be interested in a handy 20-page booklet published by *Oakite Products, Inc.*, describing a unique chemical development for the control of obnoxious odors. This booklet gives data on successful application and uses of this recent scientific development known as *Oakite Tri-San* which is said to perform, all in one operation, three important sanitation jobs of deodorizing, cleaning and disinfecting. Primarily designed to simplify plant sanitation procedures through its triple-duty properties, this material is reported to be especially effective in industrial plants where odor control is a recurring problem. Economy of use, ease of application and adaptability of *Oakite Tri-San* to special sanitation problems are other added features discussed in this booklet. Write to *Oakite Products, Inc.*, Dept. MF, 26 Thames St., New York 6, N. Y., for your free copy.

Dust Collectors

Individual type *Dustkop* dust collectors suitable for collecting dust, dirt and lint from dry grinding, buffing, polishing, etc., are described in a new catalog, *A-350*, available from *Aget-Detroit Co.*, Dept. MF, 602 First National Bldg., Ann Arbor, Mich.

Also included in the literature is a vapor collector, designed to collect vapor from screw machines and similar machining operations employing coolants.

Specifications of models with ratings, together with prices of units and accessory equipment, are given in addition to illustrations of typical installations.

Finishing of Zinc Alloy Die Castings

Zinc alloy die castings have won universal recognition for their economy, strength, and dimensional reproducibility. In a 52-page bulletin the *New Jersey Zinc Company's* technical department describes methods of transforming rough castings into consumer products having eye-appeal and durability.

This attractive pamphlet, entitled "*Finishing of Zinc Alloy Die Castings*," furnishes data for the commercial copper-nickel, straight nickel, and nickel-chromium plating of zinc. Also included are the preferred polishing and buffing methods and, of particular importance, the special cleaning procedures required for proper surface preparation of the castings prior to plating.

All phases of the finishing operations on zinc die castings are competently discussed in the booklet, available upon request from the *New Jersey Zinc Co.*, Dept. MF, 160 Front St., New York, N. Y.

Maintenance Hints

Of interest to Latin American business

**STAINLESS STEEL
POLISHING
COMPOUNDS**

Use it with any kind of wheel—soft, medium or hard—and the results will speak more eloquently than anything we could say.

Tell us about your toughest job, and we'll be glad to send the "4-A" product that will solve your problem. No obligation, of course.

Instead of glue, use "4-A" Cement and Thinner, a uniform substitute for polishing Wheels, Belts, Buffs, Rolls, etc. Samples of Compound or Cement sent on request.

HARRISON & COMPANY HAVERHILL, MASS.

**If It's Stainless Steel
Polishing It's a "4-A" Job**

It's been proved every day in every kind of metal working plant: "4-A" Polishing Compounds are faster, more efficient and more economical for cutting down, polishing and mirror finishing all kinds of steel, including stainless and radium.

**CEMENT
AND
THINNER**

expenses and maintenance officials is a new bulletin available in both Spanish and English, offered by *Turco Products, Inc.* Fully illustrated, *Bulletin AS-362 "How to Speed and Simplify Cleaning Methods in Industrial Plants"* gives valuable information concerning rust removal, water-scale elimination, steam cleaning, paint stripping, metal surface treatment and general maintenance.

Address all inquiries to *Turco Products, Inc.*, Dept. MF, Export Sales Division, P. O. Box 2649, Terminal Annex, Los Angeles 54, Calif., U. S. A.

Goggle Cleaning Cabinet

A new 2-page bulletin features the M.S.A. Goggle Cleaning Cabinet with Fogpruf for installation in mills, factories, and wherever goggles are used—designed by *Mine Safety Appliances Co.* to encourage workers to wear their goggles and to keep them clean.

M.S.A. Fogpruf is claimed to completely free goggles of dirt and grease and prevents fogging of lenses, permitting clear vision at all times, thereby promoting worker comfort, safety, and efficiency and helping to prevent accidents. The cleaner is available in liquid or paste form in convenient applicator vials.

For a copy of the 2-page bulletin No. CE-28 describing and illustrating the cabinet and M.S.A. Fogpruf, write to *Mine Safety Appliances Co.*, Dept. MF, Braddock, Thomas, and Meade Sts., Pittsburgh, Pa.

pH Control Instruments

The *Bristol Co.*, Dept. MF, Waterbury 91, Conn., has announced a new bulletin, No. PH1302, describing its line of pH control instruments.

Bristol continuous pH controllers and recorders are described in detail including electrode assemblies and accessories. The bulletin includes engineering and technical information relative to pH theory and measurement. A variety of actual installations are described; with chart records, photographs, and flow diagrams included.

Copies of the bulletin may be obtained from the company at the above address.

Koroseal

"*Koroseal, The Modern Flexible Material for Industry*," an attractive 18-page booklet, has been published by *The B. F. Goodrich Co.*, Dept. MF, Akron, Ohio. Koroseal is the plastic developed by the company's researchers which made the entire polyvinyl chloride group of chemicals commercially available.

Following a short history of the development, the booklet outlines the material's resistance to destructive elements, including corrosives, oils and solvents, flame, water, moisture, heat and aging, sunlight and oxidation.

Mechanical properties, including adhesion to other materials, flexing, machining qualities, abrasion resistance, coefficient of friction, hardness, impact strength, tensile strength, elongation, compressibility, compression set and dielectric strength are comprehensively discussed.

Physical aspects of the product, including weight, volume, stability, contamination and

TROXIDE

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A nationally known manufacturer (name on request) prefers and uses Troxide . . . after testing both the conventional acid solution and a Troxide solution in treating cold-drawn, heat-annealed steel cylinders. Here is why:

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No etching occurred with Troxide. Action on good metal lessened uniformly with solution strength.

Conclusions

- TROXIDE lasted 14 times as long as the conventional acid solution.
- TROXIDE saved manpower.
- TROXIDE saved metal.
- TROXIDE reduced rejects.
- TROXIDE protected workers and equipment from the dangers of acid mist.
- TROXIDE SAVED MONEY.

Perhaps Troxide can do the same for you. What is your pickling problem? Let us solve your bright-dip problem, also. Just write "Troxide" on your business card and mail today.

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toxicity, odor and taste and color are also described. Various forms in which the material is available, including sheets, molded articles, tape, gels, solutions, extruded forms and coated goods are given.

Numerous industrial applications of Koro-seal in all its forms are graphically pictured and described, with a chapter devoted to consumer uses of the material.

Air Foam

Pyrene Manufacturing Co., Dept. MF, 560 Belmont Ave., Newark 8, N. J., has issued a booklet describing the newer mechanical or air foam for fire fighting which, unlike the foam in use for years, is formed without chemical reaction. The booklet tells how air foam is produced either by portable playpipes or stationary foam makers. A pictorial record of the largest test fire on record, a 93-foot diameter oil tank, which was extinguished in four minutes is also shown. Copies are available from the company at the above address.

Cleaning Compounds

A twenty-four-page catalog of information regarding thirty-nine different cleaning and drawing compounds has just been released by *Northwest Chemical Co.*, Dept. MF, 9310 Roselawn, Detroit 14, Mich. Five general classifications of cleaners are covered, namely: (1) Electrolytic; (2) Immersion; (3) Solvent; (4) Spray, and (5) Water Wash compound for spray booths.

Associations and Societies

American Society for Metals

The 28th annual *National Metal Congress and Exposition* will be held in Atlantic City's Municipal Auditorium for five days beginning November 18th, according to an announcement made by *W. H. Eisenman*, managing director of the event.

Meeting jointly during the NMCE will be the *American Society for Metals*, the Iron and Steel Division and the Institute of Metals Division of the *American Institute of Mining and Metallurgical Engineers*, the *American Welding Society* and the *American Industrial Radium and X-Ray Society*.

According to Mr. Eisenman, floor plans for the regular 1946 Exposition at Atlantic City have been sent to organizations participating in the 1945 event which was held in Cleveland earlier this year.

The holding of the National Metal Congress and Exposition in Atlantic City marks the first time in five years that the event has been held in the East. It is anticipated that approximately 70% of the 1946 attendance will be from the Eastern section of the country.

On the basis of previous attendance figures for these meetings in Atlantic City, it is estimated that more than 25,000 executives, engineers and production men will visit the Exposition and attend technical sessions of the five societies meeting during the five-day period.

Master Metal Finishers Ass'n of New England, Inc.

Metal Finishers in New England have been very active during the past few months in holding meetings which have been of definite value.

The chief subjects for discussions at monthly meetings have been Price Ceilings, Labor Relations, Costs and "The Value of a National Association."

Under the heading of Price Ceilings, the entire industry, in cooperation with Associations in other sections of the country, has been lining up the proper procedure to convince the Office of Price Administration that the Industry has reached the point where competition will hold the general level of prices in line. Price ceiling controls should be abolished.

Four delegates from the New England area went to Washington to present to the Office of Price Administration arguments for decontrol of price ceilings on the basis that competition will hold prices in line. The delegates were Ray A. Stevens, representing The Guild Associates; R. A. Campisi, president of the Industrial Enameling Corp. and president of the Master Metal Finishers Association of New England; Colgate Gilbert, of the Gilbert Associates, Walpole, N. H., and vice-president of the Association; and Ernest D. Callahan, of F. M. Callahan & Son, Malden, Mass.

The New England Association is fortunate in having as its president R. Alfred Campisi, who is a keen analyzer of economic conditions. He has led the New England group through the current maze of Government restrictions and controls with an almost uncanny understanding of the needs of the industry.

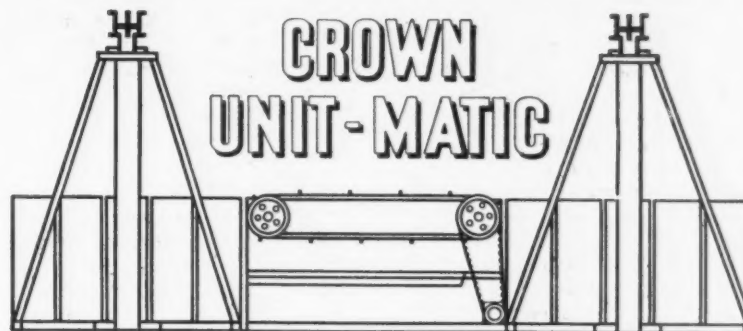
There is a very strong movement on foot to organize a National Association of Metal Finishers. Several meetings have been held to bring together the various local Associations throughout the country. It is planned to have a National Association represent the industry in those branches of management which require concerted over-all cooperation and New England men will be prominent in directing the affairs of this coordinated grouping of national interests.

On March 26, three representatives of The Contract Plating Co., of Stratford, Conn., Ray O'Connor, Frank J. Kalafus and Walter Rotzol, lectured before the New England Association on the subject of Metal Finishing Cost Systems. This company is the largest operator in New England and is well qualified to present for the entire industry the proper method of costing metal finishing jobs. Their system does not lend itself readily to the small shop but it does serve as a guide to the best costing methods.

Job Evaluation, Group Advertising, Insurance Coverage and many other subjects are on the agenda for future meetings. This New England Organization, the Master Metal Finishers Association of New England, under the leadership of The Guild Associates with Walter R. Guild, as managing director, and ably assisted by a staff of qualified trade association counselors, has set up an ambitious program for the development of this industry.

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News from California By FRED A. HERR

Precision Gauge Plating Co., 1045 North Mission Ave., Los Angeles, has completed installation of the final units of \$10,000 worth of new equipment acquired since last fall. The company is operated as a partnership by *Clif Grace*, who was formerly with *Wapner Co.*, jewelers, Los Angeles; and *F. F. Jones*, formerly with the *Morey Co.*, hard chromium platers.

Included among the new equipment are a 480 gallon chromium tank, a 550 gallon copper tank, a 780 gallon nickel tank, a new polishing lathe, a new blower system and a 1,000 ampere generator.

The job shop plates fireplace legs, frames for fireplace screens, stainless steel barbecue cutlery, Dural salt shakers and miscellaneous other items.

Carroll McLaren has resigned as plating foreman of *Chief Products, Inc.*, Los Angeles, manufacturers of aluminum house-

hold ware, to assume a similar position with the *Grayson Heat Control Co.*, Lynwood, Calif. Still in process of reconverting from plane part anodizing, which was one of its principal wartime activities, the *Grayson Co.* is gradually getting its plating shop back to a peacetime schedule in which the finishing and polishing of thermostat controls and accessories, and stove and range clocks in nickel, chromium, copper and brass predominated.

Albert L. Speer of the *S.&W. Plating Co.*, Los Angeles, reports he is installing a new plating shop in the manufacturing plant of *Bel-Air Creations*, 3541 Cleon Ave., North Hollywood. The shop, according to *Speer*, is being equipped to handle plating and polishing of gold and silver compacts and cigarette cases and plastic items produced by *Bernard Katiz*, proprietor of the *Bel-Air Creations* factory.

Speer estimated that equipment being installed, in anticipation of opening of the shop by mid-June, will cost an estimated \$9,000. The plating room, he said, measures 50 x 60 feet. The equipment will in-

clude, he reported, six solution tanks, polishing lathes, an enamel baking oven and component metal deposition equipment. The shop, according to *Speer*, will employ a staff of about 15 men, headed by *Carl Tucker* as plating foreman.

Marcus D. Rynkofs, head of the *Liberty Plating Co.*, Hollywood, Calif., who is Los Angeles A.E.S. Branch's candidate for Supreme Second Vice President at the Pittsburgh convention, left Los Angeles on May 6 for a five-weeks' business trip to the middle-west and east coast.

Mr. Rynkofs, who has construction underway on a large new postwar plant for the *Liberty Plating Co.*, made the trip in an effort to attempt to expedite delivery from Detroit, St. Louis, Chicago and New York of some of the new shop equipment he has on order, to try to buy a new car in Detroit and to visit relatives in Pittsburgh. He attended the Chicago Branch A.E.S. meeting in May, and made visits to the plants of *LaSalco* in St. Louis, *L'Hommedieu* in Chicago, *Hanson-Van Winkle Munning* in New Jersey, and other plants.

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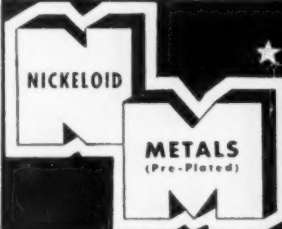
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